SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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No. 2084.—VOL. XLV. LONDON, SATURDAY, JULY 31, 1875. PRICE (WITH THE JOURNAL) SIXPENCE. PER ANNUM, BY POST, £1 4s.

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Steam Pumps, Shipbuilders' Tools,

BAR SHEARS.

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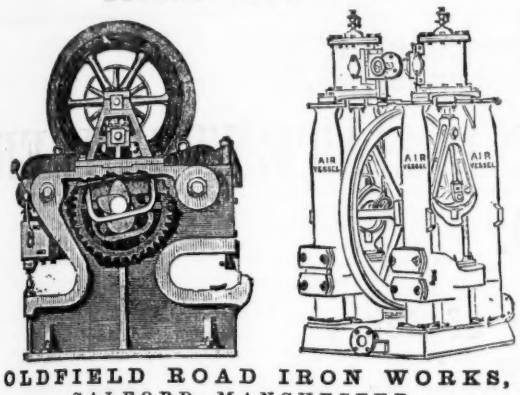

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Obtained the PRIZE MEDALS at the "ROYAL EXHIBITION" of 1851; a the "INTERNATIONAL EXHIBITION" of 1862, in London; at the "IMPERIAL EXPOSITION," held in Paris, in 1855; at the "INTERNATIONAL EXHIBITION," in Dublin, 1865; at the "UNIVERSAL EXPOSITION," in Paris, 1867; at the "GREAT INDUSTRIAL EXHIBITION," at Altona, in 1869: and at the "UNIVERSAL EXHIBITION," Vienna, in 1873.

BICKFORD, SMITH, AND CO., of TUCKINGMILL, CORNWALL; ADELPHI BANK CHAMBERS, SOUTH JOHN-STREET, LIVERPOOL; and 85, GRACECHURCH-STREET, LONDON, E.C., MANUFACTURERS AND ORIGINAL PATENTEES of SAFETY-FUSE, having been informed that the name of their firm has been attached to fuse not of their manufacture, beg to call the attention of the trade and public to the following announcement:—

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They have no weak parts.
They act without shock *upon any of the operating parts.*
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N.B.—Correspondents should state particulars as to character of work in hand in writing us for information, on receipt of which a special definite answer, with reference to our full illustrated catalogue, will be sent.

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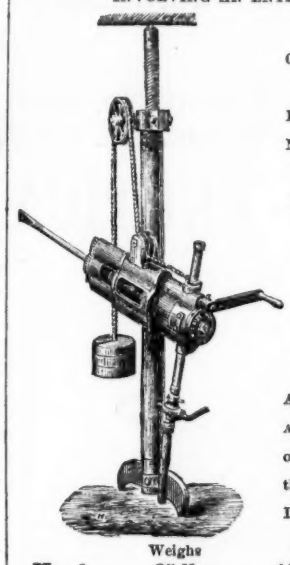
INVOLVING AN ENTIRELY NEW PRINCIPLE.



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NO JAMMING OR BREAKING DRILLS.

NO FIXING NOR STAYING.

NO STRIKING ACTION IN VALVES.

MAY BE USED WITHOUT ANY STAND.

N.B.—The under-noted prices are for THE DRILL COMPLETE,

And instead of INDEFINITE GENERALITIES, ACCURATE DATA are given below, with the object of enabling purchasers to compare the "WARSOP" in all points with other Drills.

	Weighs	Bores	On tripod.	On heading stand.
No. 1	65 lbs.	1½ holes	£60	£76
No. 2	80 „	2 „	66	80
No. 3	105 „	3½ „	88	104

HEADING STAND weighs 1 cwt.

No. 2 DRILL on HEADING STAND (2" holes)	£76
No. 1 AIR COMPRESSOR and ENGINE	85
W. 1 AIR RECEIVER	23
Total	£184

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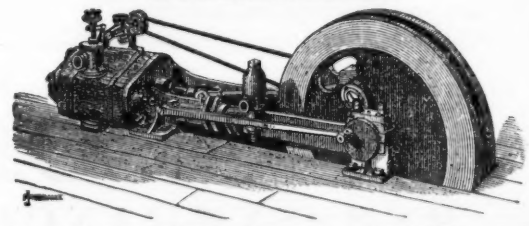

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"THE ECONOMIC" COAL CUTTER,

FOR SIMPLICITY, ECONOMY, AND EFFICIENCY UNEQUALLED.

AND SUPERIOR

AIR COMPRESSORS;

ENGINEER AND CONTRACTOR FOR

Mining Machinery of every description.

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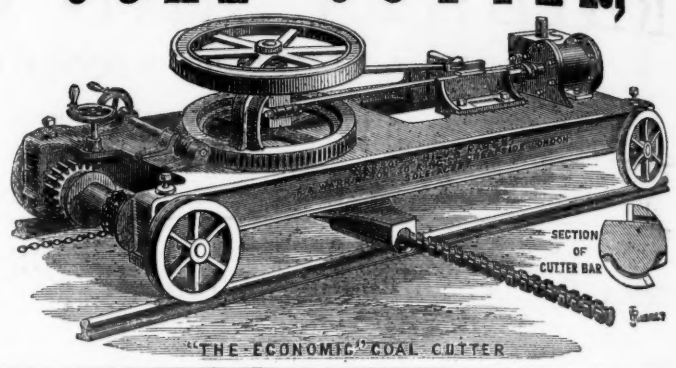
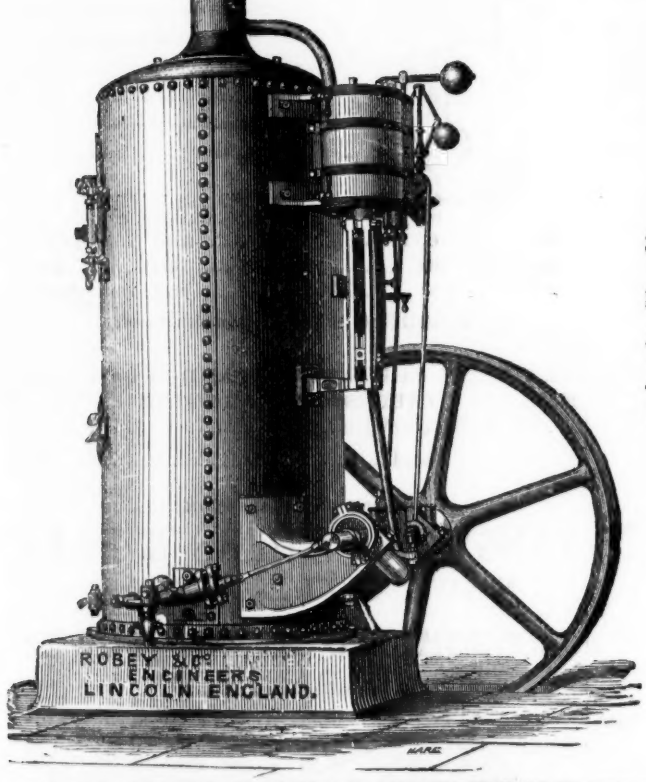


"THE ECONOMIC" COAL CUTTER

Patent No. 4136 - - - - - - Dated 16th December, 1873.
Patent No. 4150 - - - - - - Dated 17th December, 1873.

IMPROVED VERTICAL STEAM ENGINES AND PATENT BOILER COMBINED.



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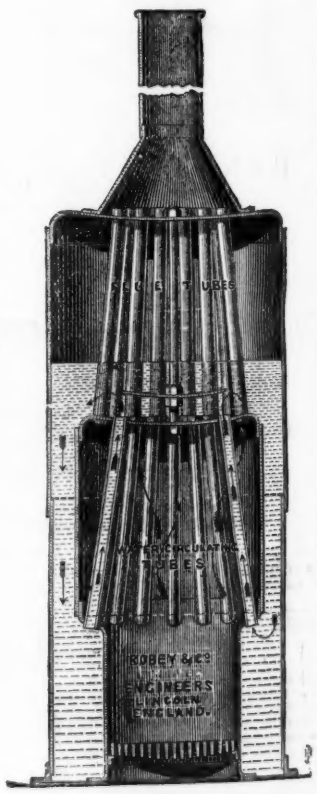

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INGOTS, Nos. I and II., suitable for Pumps, Pinions, Ornamental Castings, &c..... £130 per ton
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Forty-two Machines employed at the St. Gothard Tunnel, Switzerland, and Forty at the Cochem Tunnel, Prussia.

These Machines are the only ones employed at the heading of Goeschenen, north side of the St. Gothard Tunnel, traversing the hardest granite.

They are also applicable to the galleries of mines, for which a special machine has been designed.

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COAL AND IRON INDUSTRIES OF THE NORTH—No. V.

NORTH-EASTERN ENGINE WORKS.

Among the many industries for which the North is famous there are none of more surpassing interest than those devoted to mechanical science. The works of Sir W. Armstrong at Newcastle, and the North-Eastern Engine Works at Sunderland, may be ranked as the most important in the two districts. The latter possess certain special features of their own which the visitor will not fail to perceive, especially if he be at all interested in the critical manipulations and nice scientific skill incident to the finer processes by which the manufacture of marine engines are carried on. The site of the works may be said to have been won from the domain of old Father Neptune, seeing that the sea approaches their base, and once, no doubt, flowed over the very spot on which they now stand. During the formation of the South Docks the excavated material, consisting principally of yellow marl, was deposited seaward, thus forming an artificial island, bounded on the north by the River Wear, on the south by the dock gates, on the west by the docks, and on the east by the German Ocean. As we approach them from the town the eye encounters a vast pile of buildings, blackened with the grime and smoke of countless chimneys, and the ear is assailed by a conflict of sounds which indicate the nature of the occupation going on within; indeed, we question whether there is a finer spectacle of human activity than that presented by the mysteries of mechanical handicraft on a large scale.

First of all are the pattern shops, which occupy the gallery or floor in the northern bay of the works, 172 ft. long by 42 ft. broad, of which one-half is allotted to each department. Here, amid the whirling of lathes, the professional exponents of engineering in its first practical stage are busily employed upon the models known only to those skilled in the vocabulary of mechanics, whilst saws of various kinds are ripping and tearing through planks, others are cutting all manner of curves, and some are hissing maliciously through the wood in a straight direction. Over head we observe the archives of the department. Arranged on shelves are patterns of portable dimensions, the shelves being labelled so that any pattern of former days can be got at a moment's notice. The next in order are the fitting shops, which are situated on the same floor, with ranges of benches on either side, at which work the skilled artizans, finishing and fitting various intricate pieces of mechanism. Donkey engines are here fitted up, silent workers, which do the water-throwing duty on board ship. There are bilge and feed-valve boxes, and safety-valves in various stages of development; and yonder is a bench devoted to the manufacture of brass cocks, valves, and so forth. Expert mechanics are busy upon them, now grinding or scraping, or filing and fitting, but all goes on with a consciousness of power truly marvellous for its methodicity and results. One corner of the department is occupied as a tracing repository, where all the tracings are kept and issued. The place is divisioned off into racks, having labels indicating any part of an engine for any contract. Leaving the fitting shop, we descend into the light turnery department, where the spectator is greeted with the subdued whirr or belts, and the more sonorous birr of wheels. Here are busy little fellows engaged in tapping nuts, others are screwing studs, some are pointing them, and others shaping, or perhaps finishing, them, whilst others are whirling off small bolts with wondrous rapidity. The prime mover of this department is a 15-horse power columnar engine, which performs something like 110 revolutions per minute, having a long tail of shafting, to which are fixed the many driving pulleys or drums, revolving with a regularity and smoothness unfailing. We mark lines of lathes flanked with sundry shaping machines of all sizes, and we behold the boring of an "eccentric," lathe, turning all kinds of brass work, and an insignificant-looking tool, carrying a cutter, which revolves at a high speed, which cuts the side of the brass nuts with dead accuracy. The guage system is carried out at these works—that is, guages and length rods are made for the workmen in lieu of dimensions being taken off the drawings. Alongside the gauge-maker's bench is a surface table, on which light work is marked off. Slotting machines are shaving out the jaws of connecting rods, drilling machines are tearing out holes in keeps, shaping machines are leaving tangible evidence of their power on crose-head slabs, and so on, all busy cutting, ripping, and finishing up the required details of engines. The erecting shop comes next. This department is 170 ft. by 46 ft., the roof being supported by a series of massive stone columns. These columns also support the travelling crane girders, over which glide the lifting powers of the department. On one side they act as a base for the various radial drilling machines; on the other is placed a range of lathes of larger dimensions than those in the light turnery. The cylinder boring mill is the most conspicuous object here. Looking into the cylinder mouth we see a block carrying sundry cutters; this block is secured to the bar, which is driven from above, in revolving it slowly descends, so that the cutters have an opportunity of altering the interior of the cylinder from an irregular surface to a glassy smoothness. Another striking object is a long screw driven from the belts, carrying with it a little piece of steel, which is virtually slicing off metal of the casting before it. Now it has taken a cut, and a deep rumble is heard from the points of contact, and a groan of victory rings forth from the yielding iron. In addition to these are the planing and drilling machines, the motive power of the department being a pair of 15-horse columnar engines, running with their customary velocity. The second erecting shop contains an array of giants, whose lifeless forms will by-and-bye become living, moving, driving, and all-powerful motors, warmed into vitality by the breath of steam. Engines of immense size and power, in various stages of advancement, crowd the department, which is fitted with travelling cranes, horizontal planing machines, double horizontal boring machines, an immense cylinder boring machine, and other plant of powerful dimensions. One of the largest of Pooley's weighing machines is here built into the ground, the rails crossing it, whereby the weight of all material is checked. The heavy turnery department is next entered, where we, of course, see on a larger scale the operations performed in the light turnery. We need not pause to describe them. The smiths' shop is then traversed, and did space permit it would be interesting to notice the operations as here carried on, but we must hurry on to the foundry.

This is an important department, the whole of the large castings being made therein. Entering the southernmost of the three bays which form it, we take our stand before the cupolas, but at a distance compatible with safety. Immediately beneath each cupola spout an excavation is made, in which rests an enormous pot. A little to our right lies the "mould" buried in one of the pits, its situation being indicated by some enormous bars, which are secured to others below, and also an elevation of loam, which is intersected by several ducts, or passages, leading to the inlet holes in connection with the interior. From around this elevation project sundry iron tubes, each crowned with a laurel of shavings; these are the vent pipes to permit of the gas which is generated on the admission of the metal to escape. Presently the slow creaking of the cranes over head is heard, in obedience to the digitial signal of the foreman, who, standing in a rather warm position, gives his silent orders to the men perched away over head, on whose care in handling the cranes much depends. The large crane-hooks are advancing, then lowered over each ladle, whilst another person engages each to the large eye of the ladle bar. Another signal, then up come the two ladles from their earthern bed, containing in the aggregate some 20 tons of metal. Away goes one crane with its burden of fire to the western side of the mould; slow goes the other to the eastern. A shade of pardonable anxiety may be seen on the visages of the men, which is heightened in intensity by the glare from the ladles, which are now being skimmed, an operation performed by a muscular youth, who with a long rake quickly drags off the surface of the boiling metal—the scum, or scoriæ. The ladles are then raised to the proper height for tilting, which is done by means of a large wheel and worm-screw secured to the ladle pivots, and being apparently the post of honour a strong, steady-handed captain seizes the wheel arms; the men round the stygian cauldrons are occasionally poking large iron rods therein. The signal being given, the man at the wheel turns it. Two floods of light immediately rush from the ladles into the loamy ducts. Whirling and bubbling they rush into the inlet holes, while a rumbling noise is heard underneath, and from each of the shaving-crowned tubes, that are now flaming from contact with the wizard's fiery rods, shoot up a roaring stream of pale blue flames. The ladles being again turned up reveal two great yawning fiery spaces, dazzling to look upon, and filling the whole foundry with an unearthly glare of bronze-like light, weird and startling in the extreme.

Passing from the foundry, we enter the boiler department. Besides the punching and shearing machines the most interesting operation to witness is the rivetting of the plates. The rivet is heated, and with the aid of a small pair of tongs it is placed in the orifice of the plate. We see its red top coming through, after which the whole boiler shell is moved, so as to have the head of it in the "dolly," or blow-resister. This done the signal is given, and immediately up goes the single arm of the Hercules, out comes the die, and squeezed is the rivet, of course; down goes the arm again, bearing the die with it, and a shivering blow is struck, which completes the job, the rivet having assumed a cup-like appearance, binding firmly the plates together. These operations are repeated with amazing rapidity, and all serve to ease the toil or labour of working men. Having inspected the boiler-smith arrangements, we emerge from this department, and note, in a general way that it has three overhead travellers, of 30, 15, and 10 tons respectively, a 15-horse power engine for driving its machines, and a siding of rails runs through to facilitate the shipment of boilers. To the left is the plate furnace, wherein are heated the plates previous to their being straightened, and also the boiler which steams the engine and the steam-driven machines. Opposite to the main entrance to the engine works are the brass foundry and coppersmiths' shops, which also possess features of interest, but which it is unnecessary to describe.

The greatest credit is due to the enterprise of the gentlemen who form this company, and whose capital has built such an enduring and massive evidence of their desire to contribute to the special industry for which they were erected, and from out of whose gates go forth, on an aggregate, some 3000 nominal horse-power in marine engines in a year, or one 120-horse power engine complete in all its details in a fortnight, giving employment to some 750 hands.

PEAT FUEL—ITS MANUFACTURE AND APPLICATION.

The Cleveland Institution of Engineers paid a visit, on Monday, to the peat works of the London Lead Company, for the purpose of seeing at work the machinery used to produce peat fuel. These works are among the largest, if not quite the largest, of their kind in the United Kingdom. They have been established for three or four years, and were originally projected for the purpose of supplying the numerous employees of the company in their different mines with a fuel that should be at once cheaper and more readily accessible than coal, which cannot be brought into these mountainous regions at a less cost than 9s. to 10s. for carriage. The peat fuel works are situated near to the Lead Company's mine of Little Eggleshope, where there is a splendid deposit of peat, varying in thickness from 10 to 15 ft., with a deposit of gravel underneath. At or within a very short distance of this point the famous Cockfield Dyke meets, and intersects the Hett Dyke, which is met with at Hetton Colliery. There is not a single cottage or erection of any kind to be seen from the peat works, except the two or three small buildings required for the purposes of Little Eggleshope Mine. All around is one vast unrelieved tract of moor land, from Middleton-in-Teesdale, 6½ miles distant on the one hand, to near Stanhope-in-Weardale on the other. The company make use of the patent peat-compressing machine of Clayton, Son, and Howlett, of Manchester. The process of manufacturing peat by Clayton's machine may be thus described:—

The peat, as dug from the bog, is first put into squeezing trucks, with mechanical arrangements for squeezing out and getting rid of a portion of the water in transit to the pulping and macerating machine. I may add that in our case, from local causes, the peat has already lost the portion of water which these trucks are intended to get rid of, and we, therefore, do not use them. After the peat is brought on to the platform of this machine it is fed into a hopper of conical shape, whence it is carried downwards by means of inclined blades, connected with a perpendicular shaft into a horizontal cylinder below, which may be termed the macerating chamber. It is then carried forward by means of a screw upon the central shaft until it meets with a series of radial arms, which are square in section, set spirally upon the centre shaft; these arms pass between knives fixed within the cylinder or chamber upon a moveable plate. In passing through these knives the peat becomes thoroughly macerated and pulped; it then passes forward into the mouth chamber of the machine, where it forms a compact cohesive mass, and oozes out of the mouthpiece, which is divided into five sections, moulded into form, and is received into trays; these, when full of the five sections or lengths of peat, pass under a cutting machine, which cut the peat transversely into convenient briquets. These trays of peat bricks are then carried away by means of a special roller, tramway, or otherwise, and placed on racks suitably arranged in tiers in the drying sheds; after remaining 18 or 20 days the bricks are dry and ready for delivery and use, similar to the samples before you. These briquets have an average density of 1·10 to 1·20, varying with the quality of the bog. In order to prevent injury to the working parts of the apparatus, from any hard foreign substance which may have found its way into the machine along with the peat, the driving pulley is fitted with a friction clutch of a special kind. The machinery is driven by a portable steam-engine of about 6-horse power nominal, fired with waste peat fuel.

The peat manufactured by this process is not only applied for domestic purposes by the company and their employees, but is also applied to the manufacture of gas at the company's smelting works. Mr. Bainbridge, the manager of the London Lead Company, has calculated the quantity of gas per ton of peat to be from 6000 to 8000 cubic feet, which, taking into consideration the difference in the size of the works, agrees with the following results of experiments made at the London Commercial Gas Works on condensed peat:—

Description of coal.	Cubic feet of gas.	Illuminating power in sperm candles.	Cwts. of coke.	Gas per ton equal to lbs. of sperm.	Sperm corresponding to gas of Boghead Cannel, No. 2 × 100.
Staffordshire	7,100	12·42	13½	302	13·6
Derbyshire	7,600	11·71	17	305	13·7
Lochgelly	8,000	18·00	13	494	22·2
Derbyshire Cannel	8,500	20·60	15	600	27·0
Wigan Cannel	10,000	20·00	13¼	686	30·9
Newcastle Cannel	9,800	25·00	13¼	840	37·8
Leshmahagow Cannel	10,500	40·00	10	1440	64·8
Boghead, No. 1	12,500	40·00	8	1713	77·1
ditto No. 2	13,000	48·00	6	2222	100 0
One ton of condensed peat yields—					
Belfast	10,500	15·65	8	562	25·3
Creavelea	9,240	18·75	8¼	594	26·7
Welsh	11,000	22·50	7	849	38·2

Experiments were made some time ago on the Belfast and Northern Counties Railway, in Ireland, with the view of testing the qualities of condensed peat made by Clayton's process as a fuel for locomotives. The trial was superintended by the locomotive engineer of the Belfast and Northern Counties Railway and the resident engineer of the Ulster Railway. These gentlemen reported that during the whole of the journey they had an excess of steam, notwithstanding that the fire-door was continually kept open, and the damper down for the greater part of the distance. The pressure at starting was 100 lbs. on the square inch, and while going up an incline of 1 in 80 the pressure rose to 110 lbs., and afterwards to 120 lbs., the fire-door being open all the time, the speed being 40 miles an hour. The following are the particulars of the trial:—

Total quantity of fuel used	14 cwts. 1 qr. 14 lbs.
Weight of train, including engine and tender	70 tons
Number of carriages	7
Miles run	74
Time running	3 hours 9 minutes
Weight per mile used of peat fuel	21·47 lbs.
Average lbs. per mile for the last three months, using Welsh and Scotch coals at a ratio of two of Welsh to one of Scotch	25·55
Average for the month of May last	26·29

At the London Lead Company's works the quantity of peat heretofore made by Clayton's process has been equal to all the calorific requirements of the different works carried on under their control. The reduction of the quantity of water contained in the peat is something extraordinary; when it comes from the compressing machine the peat, containing not less than 70 per cent. of water, and after a fortnight's drying, first in the covered drying sheds, and afterwards in the open air, this proportion is reduced to about 20 per cent. As regards the cost of the peat fuel, it is found to be quite as low by this process as by any other. Meadows, in his "Review of the Peat Question," states that—

The cutting, drying, and stacking of ordinary turf is generally done by contract, where the quantity is considerable, and the rates paid of late years show that the labour cost averages about 3s. 6d. per ton. If we include rent, superintendence, and contingencies, we may safely assume that the cost will be found not to exceed 4s. 6d. per ton. To this, if we add a sum of 5s. for cost of carriage and of storing the turf for sale—as, for instance, in Dublin—and if we increase the amount by a sum of 3s. per ton for cost of management and interest on capital, then for 12s. 6d. 1 ton of good ordinary turf could be sold with a fair profit in the city of Dublin, or in any city or town to which turf could be carried from the bog, and stored at the rate of 5s. per ton.

We have proofs based on extensive practical results, that in taking 2 tons of turf, as equivalent in heating power to 1 ton of good coal, we are sure to be on the safe side of any estimate made with reference to the value of peat fuel.

As long, therefore, as good coal shall cost in Dublin (or elsewhere) more than 25s. per ton it would be advisable for many purposes to use turf, as there are economic reasons that make 2 tons of turf more than equivalent to 1 ton of coal. For instance, there is always more or less waste in coal in the cinders and unconsumed portions, while in turf all is consumed, and only the ash left behind. Again, a smaller fire may be made for occasional purposes with turf than it would be practicable to make, cost for cost, with an equally small quantity of coal. It is a mistake, therefore, to continue to think that we cannot improve our condition in the matter of turf fuel until we find ourselves producing improved fuel out of the fibrous portions of our bogs. If years ago the Dutch thought so, would we find them at present with turf as the staple fuel of their country?

Mr. Binbridge has found at the works of the London Lead Company that peat can be made for 5s. 6d. to 6s. per ton, and he hopes by the use of a new condensing machine, recently invented and patented by himself, to still further reduce the cost. There are three methods usually employed for the manufacture of peat. The first is hand-cutting, the second is compression, and the third is condensation by means of disintegration. The first system is now all but obsolete, and cannot yield a product of any value as an article of commerce. The second system, that of compression, is that which is now invariably adopted in mechanical appliances designed for the purpose, while the third promises to be the system of the future. What is wanted for general manufacturing purposes is admittedly fuel of a denser, firmer, and more compact nature, and the system that shall most closely approach the desideratum will justly claim precedence. The Purdon Commission put in the following form the germ of all the experience available on the peat question.

1.—That the main object sought to be attained in all the systems taken as a whole consists in increasing the density of the peat, so as to present in a smaller space, and consequently in a more effective condition, the quantity of heat already possessed by any given weight of peat. But there is not any increase made in the original quantity of heat, inasmuch as there is neither any addition made to the peat itself, nor any element unfavourable to the development or generation of heat withdrawn from it in the process of manufacture.

2.—That the value of all such systems is, therefore, proportionate to the need that exists for effecting density, and that this value is variable, according as peat in the natural condition is capable of yielding a more or less dense fuel, without requiring any mechanical treatment for the purpose. In other words, that while it would be desirable to subject peat in which the fibrous structure exists, to an extent unfavourable to density to one or other of those mechanical processes for its improvement, any such treatment would be practically of little or no use for peat which, when cut in the usual way, will give a fairly dense turf without the aid of mechanical systems.

It is objected to the mechanical appliances used for the compression of peat that it fails to break up and destroy the fibre, which is essential before the peat can lose its moisture. The application of pressure to wet peat was first attempted, and failed. It was then proposed, first, to dry the peat, and then to subject it to pressure, and Eter's system for the manufacture of peat fuel on this principle has been found to answer in some localities. Generally speaking, however, compressed peat has proved a failure, because the moisture could not be eliminated so far as to secure the required density. In compressed peat this density is given by the direct application of mechanical force, whereas in condensed peat the density arises from the natural shrinkage and aggregation of its parts. The earliest attempt at preparing condensed peat on this principle was made by Mons. Challeton at this works in France in 1860. Numerous other inventions have been devised with the same end in view, but scarcely one of them has come to be adopted on anything like a large scale. Another has now been added to the list, and Mr. Bainbridge is very hopeful that his machine, which has hardly yet got beyond the region of experiment, will come to supersede all others. The principle of the machine, which the Cleveland engineers were permitted to inspect on Monday, is very simple. The main novelty lies in the delivery part being allowed to travel at a slightly faster speed than the feeding part, so as to keep the cutters clear, and the cutters themselves run at a speed eleven times greater than the feeding action. The cutters are so arranged and worked that the peat as it passes through them is completely disintegrated, and requires three or four days less to dry than the peat prepared by the Clayton process. But the chief advantage gained by the new process is increased density of fibre. Specimens of the prepared peat were handed to the visitors for examination, and the density of the product created general astonishment.

It was stated that arrangements are about to be made at the London Lead Company's works for undertaking on a rather extensive scale the manufacture of peat charcoal for the purpose of metallurgy. To this end Mr. Bainbridge has patented a new process, which will shortly be in operation. Specimens of peat charcoal made at these works were handed round for inspection, and it was remarked that there was little to distinguish it from oak charcoal worth from 4*l.* to 5*l.* per ton. The company's principal difficulty is that of want of carrying facilities. The peatworks are about seven miles from the nearest railway station, and if the charcoal was to be used for smelting purposes carts would have to be employed at a considerable expense to carry it over this distance, unless, indeed, the demand was sufficiently great to justify the company in going into the thing on a very large scale, and laying down a line of railway.

It may be remarked that in spite of the growing cheapness of coal, increased interest appears to be taken in the question of the utilisation of our peat resources. Mr. Hans Dauchell has estimated the area of peat bogs in Great Britain at 6,000,000 acres, and Sir Robert Kane has calculated that in Ireland alone there are 2,830,000 acres of peat deposits. Practically, therefore, the supply is unlimited, and its utilisation may well be described as an imperial consideration of the greatest importance. It is true that many have failed in attempting a solution of the peat problem, but in the majority of cases failure has followed upon attempting too much. There are certain clearly defined and obvious lines within which peat may be utilised with profit and without risk, and the steps now being taken by the London Lead Company are, in pursuance of these lines, tending towards exceptional success.

THE LONDON FINANCIAL ASSOCIATION.

SIR,—At a period when the Money Market is in an exceptionally favourable position, and capitalists are seeking solid investments, it is to be hoped that the directors of this company will endeavour to realise some portion of the substantial assets they possess in no less than nineteen railway companies in England, Wales, and Ireland. According to the published accounts about one million sterling of these assets consists of debentures and preference stocks, all fully paid up; and it is probable that if these several railways had now to be constructed the cost would be at least double that of the original outlay. But, in addition, the London Financial Association became possessed as mortgagees of these lines on comparatively favourable terms—that is to say, they got security for an amount nominally double their advance, and the undertakings ultimately became their property absolutely. If, therefore, these various lines were essential to the traffic of the country, and not superfluous works, the company, first as mortgagees and afterwards as owners, may be said to hold at present something like four times the nominal value of their advance. In other words, if any set of contractors were required to create those various undertakings which the London Financial acquired ten years ago for the sum of 1,154,000*l.*, they could not probably do so under quite double the original cost—4,540,000*l.* This sum, in fact, much more faithfully represents the value of the company's assets than the present price of the shares. This time last year these 30*l.* shares were quoted 17 to 18; now they are quoted 7½ to 8½. If the above reasoning be sound they should rather be quoted 60, or even higher. Two of the company's lines

are the Cambrian and the Swansea, which are connected with the great leading railways, and should form a part. In addition, the company possesses the greater part of the Muswell Hill property, which is a freehold, and the Alexandra Palace. As building land this lot is really worth more than the present quotation of the shares. It is said that the property of the London Financial requires time to develope its full value. This is doubtless the case; but it is all fully paid up, as the accounts show, and further outlay is not essential. However, the proper course to pursue at present seems to be for the directors to realise some of their assets; to offer some of their lines to the great adjoining companies, or to bring their several stocks into the market, and offer them to the public. When sold the assets should be divided among the shareholders. If this course were steadily pursued as occasion offered it is not unlikely that the whole capital would be ultimately returned.

July 26. A SHAREHOLDER.

PRACTICAL MINING—MACHINE AND HAND LABOUR.

SIR,—The question of the comparative cost of machine and hand labour in the driving of levels, although of the deepest interest to the mining world, remains surrounded in mystery—an "enigma of life." Inventors of perforators all declare their own particular machines to be the best, the cheapest, to have the fewest parts, to work with incredible speed, and so on. Speed is made to appear the one thing needful, and not one word is said about the cost. If every mining company had an unlimited command of money speed would no doubt be a primary object, and cost only a secondary consideration; but inasmuch as the capital of all companies is limited, a careful husbanding of our resources is an absolute *sine qua non*. If for the sake of speed—say, double, treble, or quadruple—we agree to pay (say) 20*l*. per fathom for what could be driven by hand at 5*l*., it is quite evident that we must speedily get to the end of our tether.

We all know that, as a rule, inventors of perforators and the engineers or mechanics who are sent to superintend their use are not miners, and herein lies the chief cause of failure. A skilful miner who knows how and where to put in his holes to the greatest advantage is put under the orders of an engineer, who crams his level forehead full of holes, the holes full of dynamite, fires away, cares not what it costs, and pulls the stuff out by the "hair of its head," and smashes machines without end. I have lately been studying the interesting reports, published every quarter by the Swiss Government, of the progress made at the St. Gothard Tunnel. Two things deserve the special attention of miners—the speed obtained, and the cost for repairs of perforators.

In the trimestrial report for October, November, and December, 1874, we have the following:—

Monthly advance—October, 113; November, 83; and December, 86 metres.

Number of machines requiring repairs—October, 79; November, 75; December, 76.

This was at the north or Goeschenen end of the tunnel. We are further told that during the quarter the cost for repairs of the Ferroux machines amounted to 2 frs. 43 c. per running metre of holes bored, and this on an average of 6352 metres of holes. At the Airolo, or south end of the tunnel, the average cost for the repairs of the Dubois-Francois machines per running metre of holes amounted to 4 frs. 27 c. on an average of 4226 metres—94, 70, and 72 machines being the monthly average requiring repair.

Now, against this I venture to submit my own costs, not only for the repairs but the cost of six McKean drills. We commenced operations in February, 1870; we have, therefore, been five years and six months at work; my total force consists of four miners, one blacksmith, and one level drawer and his horse; I have had six machines, for which I have paid 600*l*., two have been thrown aside, and four are still in use. I value these four as about equal to two new ones; therefore I put down the following items—

Cost of four drills		£400
Repairs of same to date	170 =	£570

During the above period I have driven 370 fms.; if we divide the 570*l*. by the 370 fms., the result will give 1*l*. 10s 1d. for the cost per fathom of ground cut for perforators and repairs. To cut a fathom of ground takes with us on an average 90 ft., or 30 yards, of holes; therefore we have 4d. per foot, or 1s. per running yard, of holes bored for the cost of the repairs and the McKean drills included.

Now, Sir, I do not care two straws for Mr. McKean, or Mr. Anybody; but I mean to say that this is a set-off against the alleged great superiority of the Ferroux drill. Unless inventors will, or can, insure us that not only the work can be done in less time, but that it can also be done for less money than by hand labour, it is useless to think that machine labour will ever be extensively introduced into metalliferous mines.

I have had five years experience, and proved that it can be done for less money. I have been hammering away—not only at the hard rocks, but in your columns—to try and settle the question, but scarcely half-a-dozen people have taken the trouble to come and see, although I am surrounded on all sides by mines and miners. What is the reason of this apathy? The fact is, Sir, the so-called mining public are not miners at all, they are simply sharejobbers who do not care a straw for legitimate mining enterprise, they will swallow any amount of untruthful advertisements and fabulous prospectuses, but the simple statement of a gentleman is not heeded in the slightest degree; he is food for plunder, nothing else.

If reform is wanting on the Stock Exchange, a revolution is required on the Mining Exchange. Why are three-fourths of the mining companies in the world in the non-dividend paying list? Simply because they were started by unprincipled men, and have been carried on by ignorant ones. GEO. WM. DENYS.

July 28.

COAL IN NOVA SCOTIA—THE PICTOU COAL FIELD—No. II

SIR,—What appear to change the strike and dip of the seams are two large faults, which run through parts of this property—one on the west end, which merely skirts the south-west corner of this area, the other passing through the property. Some distance from the south-east corner this fault will make it very difficult to work the coal on the east side of the fault. These two large faults are running parallel to each other in a direction nearly north and south. These two faults are not the only ones in this property. There are some which do not show on the surface, and are only discovered by working the mine, or by the sudden changes of seams or quality of coal itself, and these faults are not always confined to one direction, as will be shown as we describe the different coal areas of Pictou county. There are two of these faults on the east side of the Ford Pit workings, running nearly parallel with the two great faults. They are small near the outcrop of seams, but increase in size as they proceed to the north and more to the dip of the seams, and will make it quite difficult to cut through to the coal on the eastern side of the fault. Then there are what may be termed cross faults upon this area, which run more east and west, and intersect the main faults, and when the main fault proves to be a regular dyke, then the cross fault will be cut off; but if the main should prove to be only a common fault, then the cross fault will most probably cut through the main and continue its course with slight alterations until it meet a regular dyke. These cross faults are more numerous in the lower seams than in the main seam, and mostly confined towards the outcrop of the coal. There are two or three of these cross faults on this area, running eastward, or nearly so, but I have seen no indications of any cross faults north of the English church running eastward on this side of the area. These cross faults are more injurious to the coal than the main dykes. They generally destroy the marketable quality of the coal from said faults to outcrop of seam when they prove a few feet in size near the surface. Therefore, whenever a coal area is cut up with large cross faults the coal between the cross faults and main faults towards the outcrop of seam may be expected to be very impure and unmarketable, and such will be found the case at the south-east end of this area, also at the south-west end. The coal will so deteriorate as not to be much better than the shales with which it is overlaid. The faulty cutting through the seam at the western side of this area appears to have interfered with the coal more so than at the eastern side of the area, or rather they have more impure coal on the western side on account of the outcrop of main seam continuing on this area nearly to the south-west corner, and although there is no exposure of any cross faults, the surface indicates no less than four between the Foster Pit and the western line. The first of these shows some indications near the Foster Pit, the other between there and Bear Brook, so that impure coal is most likely to be found quite a distance down from the outcrop all the way from the Foster Pit to the western boundary line. These faults and other causes will diminish the marketable coal very much in this area. The diminution will be enormous when compared with the large amount of coal matter underlying this area, so large that it will be almost incredible that such could be the case. I do not wish it understood that I have pointed out all the faults cutting through this property, because such is not the case. There are always more or less faults which do not show at the surface, therefore they must be proved by mining operations and not by geological study.—*New Brunswick, July* 5. PRACTICAL MINER.

MINING IN MICHIGAN, LAKE SUPERIOR.

SIR,—I have been here over 20 years, and not a season in that time did this section of country (Lake Superior) look so dull in mining as at present, while the prospects were never better. Commencing with the once-famed Minesota Mine, which for several years declared large dividends. The mine is now full of water and abandoned, said to be poor in the bottom. I will admit that the lode does not look so well in the bottom as in the upper levels, but you will agree with me that all lodes are subject to poor points, and again make mineral. And a lode holding down so rich as Minesota so deep as 150 fms., because one level, or even two, not meeting with any slides, nor any other interruption to disturb the character or course of the lode, it is not reasonable to suppose that the lode had ceased altogether to be productive. The lode is a masterly one, having conglomerate for a footwall, and undoubtedly is as rich a little further down than the present bottom of the mine as it has been upward. True, it called in $300,000 assessments inside of 20 months to prove the mine in depth; but what did they do with the money? They sunk two shafts, one lift each, and drifted a few feet, and the balance of the money was fooled away in experimental machinery, which, at least a considerable part of it, proved a failure, and the mine was abandoned, or rather offered to tributors, who took it at two-thirds tribute, and made from $1000 to $2000 or $3000 a-year each man. They continued this until the water rose, and drove them from level to level up to near surface. Of course, the tributers would gladly work the mine now if the water were taken out and kept out. To keep the mine drained would simply cost about $350 per month, or (say) about the price of 1 ton mineral. Scores of tons of mass copper is now lying in old stulls throughout the mine. Tutwork men were not paid for taking care of copper, and whenever there was a chance they would allow masses even to be buried up, rather than put them on one side. During the time the mine was wrought upon tutwork a slight accident happened. One of the miners, while eating his dinner in a level, allowed his candle to set on fire one of the stull timbers, not having watered it at the time. The timber was burnt through, and, as you might suppose, the rock came down in the level (say) to about 15 tons. Afterwards the place was secured and the stuff removed, and the party thus employed found in that pile several masses of copper, amounting in all to 3 tons.

Through the abandonment of the Minesota the National Mine, being on the same lode and close by, was also abandoned, even with masses of copper in sight. Their deepest shaft was being sunk when the mine stopped. In the bottom of that shaft there is now a mass of copper supposed to be tons in weight; over 1 ton of it is exposed. Those masses generally run to 70 and 80 per cent. copper. Since then tributers came in and made their piles of money, equal to the Minesota tributers, or even better, until water drove them away likewise. These properties, by all practical miners, are looked upon as valuable ones, well worthy the attention of capitalists.

Through the stoppage of these mines all others materially suffered. Some were immediately abandoned, while others materially reduced their forces, although having very encouraging prospects. But the different companies thought the conglomerate lode of the Minesota and National was a failure, and acted as though every other lode in this county would soon prove a failure likewise; and never since has there seemed to be any ambition or disposition to give any of these mines a fair trial. I will soon send some remarks upon mines in Keweenau and Houghton counties. A MINER.

Ontonagan, Lake Superior, July 5.

GOLD IN WALES—No. I.

SIR,—This fascinating subject has occupied my mind at times for nearly a quarter of a century, and it is not the first time I have addressed you thereupon. Perhaps I may have had as many alternating hopes and fears about it as anybody living, but it is simply impossible to divest the subject of its mineralogical interest, let the profit and loss account in dealing with it commercially be whatever it may. It is no object of mine to write down gold mining in Wales, nor is it my intention to write it up for any speculative purposes whatever. I claim some sort of familiarity with the subject, because I have carefully preserved all the comeatable data of the gold discoveries in Merionethshire; and a pretty long series of explorations and experiments, chiefly at my own personal cost, gave me a remarkably interesting insight into the natural history of the gold district, under difficulties of a very varied character, some of which were entirely outside the mechanical and metallurgical contrivances of the hour which were of themselves occasionally perplexing in the extreme.

After the lapse of years, and without being personally interested to the value of a postage-stamp in the transmutation of the Welsh mountains into golden mice, I have re-visited the delicious valley of the Mawddach, making head-quarters at Thornton's Hotel at Tyny-groes, where, by the way, if a fellow cannot make himself comfortable in the enjoyment of a charming view outside and excellent fare inside he had better stay at home for the term of his natural life.

I have now taken a look, and most likely a farewell look, at the resorts of the old, as well as the more recent, gold-catchers, and also at a new place, of which it is solemnly pronounced—"Gold was got here 200 years ago by the Romans." Although more than 20,000 ozs. of gold have been caught in the district, up to this moment, I have not discovered that the problem of gold-extraction from the sulphides thereabouts has taken a single step in advance in 20 long years. Unaccountable as it may seem, it is literally true that gold-catching contrivances have been erected on one spot where the self-same principle failed more than once in the times gone by, and, of course, with the like profitless result. There are several gentlemen at the present time in the neighbourhood with special programmes for getting out the gold concealed in the sulphides of the district. It remains to be seen what they can do more than their predecessors. It is monstrous impertinence to assert that it is impossible to extract gold from sulphides, and they are, therefore, to be cheered onward in the endeavour to solve that which ought to be in this "hotbed of intelligence—England" no enigma at all.

There is a species of zymotic disease called "gold fever," which, as far as I know, has not yet yielded to any therapeutic treatment. It is extremely contagious. In a mild form it is rather pleasant than otherwise, but when very acute patients get "off their head," as the saying is, and nothing seems to go right; gold becomes "small by degrees and beautifully less," screws somehow get loose, machinery goes to pieces, and the question itself retires into a sort of hybernaculum. I know of no good reason why it should necessarily be so; but it is so. Persons more or less affected by this rather rare disorder are flitting about this gold-favoured locality just at present. The mineral rights of the Crown (as far as gold is concerned) and those of private individuals as well are, I hear, being voraciously snapped up by some of "the oldest inhabitants," as well as by foreigners (*i.e.*, Englishmen and Scotchmen). Golden mushroom spawn is said (perhaps ill-naturedly) to have been industriously and skilfully planted, exactly enough in the shade to be faintly visible, and all patriotically in the hope of a good crop of something coming up in the immediate future. A large area of "Crown land" has been "taken up" (most of it not worth half-a-crown) to be put down again, I suspect, like a hot potato presently, although some of these hazardous adventures have a nominal capital of (say) at the most 10*l*. sterling, which is cautiously shared in by fewer than 20 subscribers, in order to keep within the letter of joint-stock law, the daring adventurers all the while revelling in the cheap luxury of "great expectations." It is said—"Fools rush in where angels fear to tread," and it has been very often seen that wise folk borrow lanterns of other folk less wise, and get suddenly left in "darkness that can be felt," either for want of oil, or of that, in association with something else, not material.

It is an indisputable fact that there is virgin gold secreted in the rocks of Merionethshire, and gold also in combination with mineral substances, such as galena, blende, copper pyrites, arsenical iron pyrites, tetradymite, &c., and, with your permission, at intervals, I will point out where native gold is and is not known to be; where, probably, it may be found sparingly and otherwise; and mention some of its modes of occurrence locally, and the difficulties constantly attendant on attempts at getting legitimate possession of it. My unwavering faith in the "germ theory" will induce me to throw in an antiseptic word or two to arrest, if I can, the germination of certain fungi that might, possibly, be poisonous to some constitutions. I propose to restate some of the old material facts and the new facts as well, if any, exactly as they stand, without reference to anybody's pecuniary interests whatsoever. "Facts are stubborn things." Certain gold facts of Merioneth are intensely interesting, and they may and ought to be truthfully stated.

London, July 20. T. A. READWIN.

ROUGH NOTES ON CORNISH MINING.

SIR,—Mr. T. S. Bolitho remarked, in a speech he made at a public meeting in Cornwall a few years ago: "It was very certain in the history of the world that Providence had kindly and easily so ordained it that no article should permanently increase beyond the legitimate demand for it, and this was especially the case with metals. He had the honour of waiting upon Sir Robert Peel, together with the father of Mr. Pendarves Vivian, as a deputation from the county, to remonstrate against the importation of foreign copper free of duty. Mr. Vivian stated that the Chili mines are now sending us 4000 tons of copper per annum; if they send another 1000 tons he believed it would ruin all the mines in Cornwall. Since then Chili had supplied as much as 50,000 tons in one year, and yet copper was not at a ruinous price."

Now, if I were a parson, I should like to preach a sermon, and would take Mr. Bolitho's striking and interesting words as my text, but I am not; however, one thing I can do is to think well on the text, and try to get a few practical lessons from it.

Is it, then, a truism, or is it not, that Providence does rule and govern the supply and demand of metals, and in the long run keeps the balance pretty even? How wonderful it is that about 50 millions per annum of coal, iron, lead, copper, tin, &c., should be yielded to us in the United Kingdom from the bowels of the earth. Let any thoughtful man consider how the supply and demand keep pace. In 1852 the capital embarked in the iron trade in the North of England did not exceed 300,000*l*., and the whole of the manufacture of iron was not above 500,000*l*. per annum. In 1874 the capital emyloyed was estimated at from five to six millions, while the value of pig-iron produced amounted to 15 millions.

In 1852 there was a general impression that pig-iron, which in the early part of the year was 36s. per ton, would never see 40s. again. By the end of the year the price was 65s. per ton, all other descriptions advancing in similar proportion. In 1857 a similar state of things supervened. In 1866, when English railways fell into discredit, it was generally believed that the iron trade had passed the highest powers of demand and production, and that no good could be expected from it again. Pig-iron fell to 51s., and such a demand accompanied this price that a large stock of nearly 700,000 tons was cleared off, while production itself had made unprecedented strides.

Well, I have given you those facts as wonderfully illustrative of the truth of my text, and I mean to stand by my text, in not allowing myself to be frightened and disturbed by a few hundred tons of tin, copper, or iron, more or less. Things will find their level, and, sooner or later, man will learn that the Lord reigneth over all, and doeth all things well. OBSERVER.

THE DIVINING ROD.

SIR,—There are undoubtedly hundreds of instances which might be brought forward equally as pointed as that given us this week by Mr. Y' Gwyr, for which he has my thanks. Your correspondent, "N. B.," seems to deprecate an enquiry, but chooses to write a long letter in order to assert that science says "It cannot be." His letter does not appear at all consistent with sound reasoning, nor, indeed, with any reasoning at all; although he claims to himself a knowledge of many things, and we should, therefore, expect from him a reason for some of his assumptions. He says the man who supports the dowsing rod must hold himself prepared to accept as truth astrology, witchcraft, and spiritualism. "N. B." does not say why; only dogmatically states that he must. He says that "nothing is a greater mistake than the comparing the dowsing rod to a blade of grass or leaflet;" but he does not attempt to show wherein the mistake consists in this comparison. He will admit that they were all produced from the earth by some power inherent in Nature. Can "N. B." tell us in what way one became a blade of grass and the other a rod producing leaves. He says "we do understand the growth of vegetables." If this be true, perhaps "N. B." will favour us with a philosophical illustration of it, beginning with the first germ of vegetable life, and proceeding step by step showing how that blade of grass, or rod, or leaflet, or perhaps turnip, was built up. He will tell us what powers Nature has brought into play to achieve this result, whether electricity, magnetism, or chemical affinity had anything to do with it; and, if all or either, perhaps he will explain in what way. If either light or heat has had anything to do with it he will show us in what manner; he will also show us how light and heat are conducted to us, and how they are conducted from star to star. He will also show us what they are; whether ponderable bodies, or only conditions of matter, and, if only the latter, in what way they can be transmitted through space. In this "N. B." must not expect us to accept any theories, unless these theories are supported and demonstrated by facts; for to accept anything less than a demonstration from one who *does* understand is to accept less than we have a right to demand, and this is a course never expected from a searcher after truth. "N. B." is not the only one who *thinks* he understands this and many other things; but I would much rather they gave us the light they have on those things than their simple assertions that they *do* understand them. "N. B." taxes Cornwall with its ignorance, and yet Cornwall has for many ages managed to send forth men into other counties and other countries who have borne very fair comparison with the men they have found there. It is, however, scarcely worth while to quarrel on the score of ignorance; for the whole sum of human knowledge is only a drop in the bucket when compared with the vast fields of natural phenomena, the secrets of which are still beyond our ken.

Astrology even may only be delusive to us, as the natural consequence of the limited capacity of the human mind; for if everything that happens occurs as the unavoidable sequence of natural law then it is possible to imagine a mind of unlimited power to understand *all* natural phenomena, and that mind must be capable of foretelling what will occur through all time. Astrology, then, and all similar sciences are opposed to witchcraft, which implies, if it implies anything, the arresting of all natural law. How then can "N. B." compel me to accept both these "*delusions*," seeing that one should act as an emetic to expel the other? Had he attempted to cram me with one at a time I might have made an effort to gulp it down; but, as he attempts to push in both, and spiritualism also, I must return all three notions for fresh manipulation. Astrology, when pursued by a mind of unlimited power, may be worth considering; witchcraft, being opposed to natural law, it is not worth while to discuss; spiritualism I do not understand, and if, as "N. B." says, it be a "palpable imposture," I shall thank him to expose it, and show its palpability. Astrology has borne good fruit, and so has alchemy—witness our present most valuable sciences of astronomy and chemistry. "N. B." would, perhaps, find it difficult to

prove that even the notions of the alchemists were altogether so erroneous as he assumes, for until the divisibility or indivisibility of matter is satisfactorily settled I do not see how the other can be proved to be true or false.

We have traced the divining rod of the ancients as having led to the dowsing rod of the present day, and it can be easily proved whether the prevailing notion as regards the latter is true or not. If true, then the divining rod has led up to the establishment of a science which may be of some value; if not true, one might surely make a few trials in the field with it without realising that dreadful calamity so frightful to "N. B.," "to ignore the Creator of the universe, and to precipitate himself in a sink of doubt and all the depths of dreadful mystery"—for it is not easy to see how a dowsing rod is going to shake the power that created the heavens and the earth, even if it assisted in showing how the mineral deposits in that earth were formed.—*Redruth, July* 28. W. TREGAY.

THE DIVINING ROD.

SIR,—As you kindly inserted in the Supplement to last week's Journal the few particulars I sent respecting the divining rod, permit me to give an additional fact of its usefulness.

It was found necessary at the Crymich Arms Station, to meet the greatly increasing traffic on this admirable line, to blast and excavate a great portion of a projecting rock; in the course of its removal a strong powerful mineral lode came in sight, and great was the sensation it created. Hearing of the circumstances I visited the spot, as dozens had done before me. Observing the lode to run east and west, and making direct for Fronlwyd sett, I at once had the dial at work, and found it passed through the middle of the field. My men are sinking the shaft. The discovery of this lode will greatly enhance the value of the sett, yet lodes were previously known to be numerous.

What I wish to convey to you on the present occasion is that I had three forked hazel twigs of the second year's growth prepared, and to prove the utility of the rod I placed one in the hands of an intelligent miner, though he had never handled one before. We commenced outside the boundary, and several fathoms to the north of where the lode was supposed to cross by the bearings taken; he proceeded up south to cross the lode, and on reaching the spot the rod clearly bent downwards. The other rods were tried, and each for six successive times did the same. The lode is copper and silver-lead.—*July* 29. Y'GWYN.

THE DIAMOND—No. II.

SIR,—It would appear, according to various historical records that we have lost sight of numerous valuable, and even notable, diamonds. Amongst others is one known as "*le mirior de Naples*," which, from the marriage of Brandon the Duke of Suffolk with Mary the sister of Henry VIII. and widow of the King of France, came into the possession of that distinguished nobleman. This gem is described as being of "almost priceless value." Amongst other causes, these irretrievable losses may be attributed to the fraticidal wars in which puritanical fury predominated over appreciation of works of art, articles of *virtu* and refinement of taste. Of this lack of good taste we have lamentable evidence in the dispersion of the crown jewels, and during this period of anachy and vulgarity no doubt subordinates, following the example of the despoiling leaders, would not hesitate to purloin and secret notabilities, many of which from lack of memory, fear of consequences upon discovery, or from death prior to an opportunity for restitution, would be lost. Besides these sources of loss others of a more legitimate character would operate. Owners of gems, to rescue them from the hands of the political robbers, would naturally deposit them in places of supposed security, and being themselves subject to the consequences of their loyalty, the hidden treasures disappeared. And, again, with the dispersion of the Court over foreign lands, and the lengthened sojourn abroad of the King's adherents, where they were doubtless frequently driven to the greatest straits for the necessaries of life, the much prized jewels—in many cases heir-looms, and considered inestimable—would be disposed of to meet the inexorable demands of nature; therefore, Sir Paul Pindar's and the Duke of Suffolk's diamonds, accompanied by such of the royal property as could be rescued from the insatiable grasp of the regicides, would share the same fate.

I am now led to the consideration of existing diamonds, and will, as far as the authorities enable me, take them in the order of their weight and value. It unfortunately happens that I commence upon debatable ground, by the introduction of one of whose true character grave doubts are current. I refer to an uncut one in the possession of the King of Portugal, and which is described by Dana, the distinguished American mineralogist, as being the size of a hen's egg, pea-shaped, slightly concave, and weighing 1680 carats. The estimated value of this stone had its identity as a diamond been established would be 20,000,000*l.* sterling. The great majority of experts, however, pronounce it to be only a topas. It is a great pity that in the interests of science its true character cannot be put fairly to the test. So far from such being the case we are assured that it is preserved with such an amount of jealousy the public are now not even allowed to obtain a glimpse of it. I am, therefore, constrained to regard the "Great Mogul" as the largest authenticated diamond. The original weight of this is quoted by some as 900, by others as from 861 to 779 carats, or now, as a rose-cut diamond, 242½ carats. In form it resembles half a hen's egg, and was procured in the year 1550, from the mine of Colone. By some this gem is said to adorn the Russian sceptre, but of this we possess no conclusive evidence, and therefore must pass the statement over as being rather mythical than otherwise. Its value, however, is set down, as I have previously stated, at some 5,000,000*l.* The Orloff, Indian cut as a rose, 193 carats. This is in possession of Russia, and is acknowledged as one of the first water. Value inestimable, though there exists a very slight flaw on one of its facets. The "Austrian," or the "Grand Duke of Tuscany," cut as a double rose, weighs 139½ carats. Its colour is decidedly yellow, a rare appearance, and there exists a tradition that the stone was bought for a trifle, as a mere coloured crystal, at a jeweller's establishment in Florence. Be that as it may, its estimated value now is something enormous. This diamond appears to be identical with the "Florentine," appertaining also to the Emperor of Austria, and otherwise described as "rather thick, covered with facets, being pointed both at top and bottom." The "Bogageni," originally weighing 254½, and now reduced to from 122 to 225 carats. This gem, it would appear, is the celebrated "Star of the South." This was found at Bogageni Mine, Brazil, by a negress in 1853, and in the rough it weighed 254½ carats, now by cutting reduced to 124½ carats. This stone has a decided tinge of colour, but whether of rose or yellow appears undetermined. One thing is certain, it bears a high character as a gem of the first water. Originally the form was dodecahedron, with bevelled edges, and it bore the impression of other diamond crystals, showing that it was originally one of a cluster. I may here remark that since 1727, when the Brazilian mines were first opened, it is estimated that they have yielded upwards of 2 tons weight of diamonds, of various weights. The "Pit," or "Regent," the next in order for weight as a cut diamond, although not the largest, is looked upon as one of the most perfect and beautiful in Europe, being equally remarkable for shape, proportions, and fine water. It was found at Malacca, and was purchased by Mr. Pitt, the grandfather of the great Earl of Chatham, for something less than 20,000*l.* Its weight in the rough was 410 carats. The cutting of this stone required the space of two years, and an expenditure of 3000*l.*, the result being a perfect diamond, weighing 137 carats. The fragments which were split or sawn from it were estimated at some thousands, and its present value may be set down at 400,000*l.* Through the instrumentality of the famous Mr. Law it was disposed of to the Duke of Orleans, then Regent of France (hence its name), for 2,300,000 crowns (92,000*l.*), the owner reserving the fragments removed. The negociations pending the sale amounted to 5000*l.*

The original weight of England's tar famed diamond, the Koh-i-noor, or "Mountain of Light," was nearly 800 carats. Prior to leaving India it was reduced to 279 carats (some say 186½ carats) by the unskilfulness of the artist, Hortensio Borgue, a Venetian, and still remaining an imperfect crystal. It was discovered in the famed mines of Golconda in 1850, and afterwards, by conquest, became the property of the Hon. East India Company, who ultimately, upon Her Most Gracious Majesty becoming Empress of India, with great good taste, presented it to her as the fittest custodian of so inestimable a jewel. The Queen, ever considerate of the feelings of her subjects, first exposed it to the public gaze at the Exhibition of 1851, and afterwards, having it re-cut, placed it with the crown and other jewels amongst the regalia in the Tower, where it remains as one of the principal attractions of that imposing pile: 2,000,000*l.* is named as a reasonable sum at which the gem is valued, according to the usual economical scale of which I shall have to speak in a future letter. The Koh-i-noor, after being exposed to the admiring gaze of thousands at the first Exhibition, was submitted to the skill of the artist to be again re-cut. Under the surveillance and direction of one of the most practical English mineralogists, Professor Tennant, the cutting was skilfully effected, but at a considerable loss of weight. In its reduced, but greatly improved, condition it now realises 102½ carats. In bulk originally it measured about 1⅝, and in its greatest thickness over ⅝ in., greatest diameter; it is now reduced to 1 7-16 by 1⅜ in. nearly, being thus diminished over one-third in weight. It is supposed by Professor Tennant to have been originally a dodecahedron in form. W. WHITE.

Laboratory and Assay Office, 25, Finsbury-place, E.C.

WEST CHIVERTON MINE.

SIR,—Seeing a letter in last week's *Mining Journal*, signed Henry Mansell, reflecting on me in withholding information from the shareholders and jobbing in the shares of this mine, I wish to give these statements my unqualified denial, and will thank you to allow me, through the medium of your valuable paper, to inform Mr. Mansell that I telegraphed the intersection of the lode in the 150, followed it with a letter descriptive of its character and appearance as far as could be then ascertained, and when cut through reported fully on its size and value, the whole of which information I sent direct to the London office as soon as I was in possession of it—a fact which he can prove for himself should he be a shareholder, and for his satisfaction I am quite willing that the committee investigate our reports, and every transaction relative to my accounts with the office. If the fluctuations of the shares do not fit his book it is a matter over which I have not the slightest control, neither do I care one jot about it, my only object being to fulfil the promises made to my employers—to make the mine pay its own costs whilst deeper development is proceeded with, and I shall feel obliged if Mr. Mansell will in the future mind his own business, and not insinuate charges against a person which he cannot substantiate. R. SOUTHEY.

Truro, July 28.

JAVALI MINE.

SIR,—With regard to the price per ton to be realised in this mine in gold produce it should have been printed as 1*l.* per ton, and not as 6*l.* per ton as stated in my letter of last week. Perhaps, if you will publish this statement, it will stop all hostile criticism as to my having been guilty of exaggeration. I quoted the very low price of 1*l.* per ton purposely. The overseer, now on the way out from Europe, will at once overcome all scruples of the workmen, who decline to work under grasping or fraudulent native ones. The opinion entertained of Javali Gold Mine by Capt. Sohns must be considered of more value than brokers' quotations. There is plenty of gold in it, and with 24 heads of stamps shortly to be at work, the iron safe on the premises must soon be filled, as the rains now due will quickly make up for unforeseen and unusually tiresome delays. In the meantime any new discoveries of richer ore will enhance the value of the returns, ¾ oz. per ton having already been obtained. ANOTHER DISCRIMINATOR.

RICHMOND CONSOLS MINE.

SIR,—McKenna and Co., outside brokers—*i.e.*, beyond the pale of the Stock Exchange—have not I surmise found their operations quite as remunerative as they anticipated, for their circular of the 24th sent to me, a perfect stranger, has only a half-penny postage stamp on it, whereas their first circular had a penny stamp and an envelope, yet I fear some few unwary ones must have fallen into the trap. These unselfish people cannot spend less than 5*l.* in sending each set of circulars to the 700 shareholders, the only motive professedly being to make the Richmond bubble burst. I happen to know some of the shareholders who have recently sold largely; their motive for selling was in accordance with their original idea when they took up the shares—to go out at a profit, and I fear that their shares fell into the hands of jobbers, who have made use of them to "bull" and "bear" the company in the merciless manner we have recently witnessed. They do not deduce a single fact to prove the falsity of any statements emanating from the board or their employees, but they simply throw lots of dirt, in the hopes of deluding unsuspecting shareholders into the idea that it will stick.

Old shareholders know the whole history of the mine too well to be humbugged. If it would not be asking too much at your hands, would you you kindly republish the letter, signed "Richmond Consols Mine Shareholder," published in your valuable *Mining Journal* of June 19, for the information of those who have recently bought shares. If they hesitate about the facts there adduced, let them write to the secretary of the company for verification. Mr. Hopkins, vice chairman, told us at the last meeting that he held 1000 shares, and that the other members of the board held largely. Can McKenna and Co. state that they are the Richmond navigators who have made their escape from the company. A line from the board as to whether they still hold all their shares would go far to strengthen waverers, and to checkmate the machinations of company-mongering solicitors, and others who are preying on nervous investors. The market value of the shares is immaterial to those who can afford to hold them. Prof. Price's calculations of the developed ore makes each 5*l.* share worth 14*l.* 7*s.* 6*d.* Time will soon prove the shares to be worth considerably more, so hold on is my motto.

A SHAREHOLDER.

[For remainder of Original Correspondence, see to-day's Journal.]

THE MINERAL RESOURCES OF THE SOUTH-WEST OF IRELAND—No. XV.

[FROM OUR SPECIAL CORRESPONDENT.]

PORTRIVE BARYTES.—Passing to the east from Dreenalamon, on the south slopes of Mount Corin, for about a mile, we come to Portrive Barytes, at which place there is a singular bend or warp to the north of the great mountain range of Mount Corin. There also appears to have been great disturbance of the rock formation about this place, and a short sketch of the discovery of Portrive barytes may not be uninteresting. For many years past in cultivating the fields the farmers found boulders of barytes of excellent quality, but never found the lode, although they pretended to know where it was. They were offered handsome gifts of money to point it out, but nothing would induce them to make known the secret. Things remained in this state until 1867, when Capt. W. Thomas was engaged to examine the district, and the first thing that attracted his attention was the complete dislocation of the east and west strata of the Mount Corin ranges by a great north and south cross-course which formed a glen in the eastern slope of the mountain, and appeared to have carried all before it. Along the line of this great cross-course there were numerous springs of water, and in the soft clay, or flookan formation, were discovered particles of barytes. Capt. Thomas, after a very careful examination of the property, came to the conclusion that the cross-course which had cut off the slate rocks was a great barytes lode, and that the boulders which have previously been found were rolled down from another lode close by—a caunter—which crops up only in one spot, and will form a junction with the great north and south lode. Nothing, however, was done to prove whether the above opinion was right or wrong until the summer of 1874, when with his brother, the late Capt. Chas. Thomas, the place was opened, and a valuable mine of the pure sulphate of baryta discovered; in fact, it is precisely of the same character as the celebrated Dreenalamon barytes. This property is advantageously situated for carrying out operations on a large scale, and a little distance north from the mine a narrow gorge between the hills may be closed, and a very extensive reservoir formed which would supply water power for pumping, hauling, &c. About 30 years ago two copper lodes were opened in this sett, and from surface diggings 30 tons of ore was raised and sold. The ore consists of purple-grey carbonate of copper, &c. The great cross-course intersects these lodes in the valley north of the barytes mine, and at this point large deposits of mineral, no doubt, will be found. Portrive is an extensive property, and presents every appearance of becoming a lasting and profitable concern, and, though recently opened, there is something more than indications to be seen.

SELF-LUBRICATING WHEELS.—The invention of Mr. A. LUPTON, of Bagilt, Flint, mainly consists in a wheel made of suitable metal constructed hollow, so as to hold a quantity of the lubricant, which is introduced by means of an aperture in the side or any other convenient part of the wheel, such aperture being closed by suitable plug or valve. The oil from the hollow of the wheel reaches the axle by suitable hole bored through the boss, in which hole a piece of wire or other suitable needle is placed, which as the wheel revolves moves up and down, and so keeps the hole from being clogged, and allows the oil to reach the axle.

Meetings of Public Companies.

NORTH AMERICA GOLD MINING COMPANY.

An extraordinary general meeting of shareholders was held at the offices of the company, Moorgate-street, on Monday,

Mr. JAMES L. SHUTER in the chair.

The SECRETARY read the notice calling the meeting.

The CHAIRMAN explained that the directors had called the shareholders together that day for the purpose of submitting the resolutions which had been forwarded to them. Since their last meeting they had sent out Dr. Stallard to the mines, and they had received several communications from him to the following effect:—That unless the board could raise some 8000*l.* or 10,000*l.* fresh capital it was hardly possible to carry on the works at the mine, and even if they raised that capital it would be some considerable time before there would be any profits accruing to the shareholders from the operations of the company. The property, according to Dr. Stallard's statements, had been uncommonly well managed, and managed with the greatest and strictest economy. He added that during the time they had been possessed of the property there had been taken out of it nearly 36,000*l.* worth of gold, and there now remained in the mine some 3000*l.* or 4000*l.* worth of gold, making together close on 40,000*l.* extracted from the property since it came into the company's hands. The work of development had been much more than could possibly have been expected, yet from the recommendations which their colleague had made the board could come to no other conclusion than to ask the shareholders to contribute towards the raising of the 10,000*l.*, or to ask them to confer on the directors the powers sought—those of leasing or selling the property. The letters received by the board were really very voluminous, and they would lead them to suppose that the property if further developed would pay particularly well. It had been uncommonly well developed up to the present time; there were very rich veins in it of gold, which would probably pay when got out, but how that was to be done without fresh capital he really was not in a position to say. All persons residing on the spot or in the locality were surprised that so little had come out of it, and according to the statements received they concurred in considering it an exceedingly rich and valuable property. It was very large, and there was enough gravel there for some 50 or 60, or perhaps 100 years working. He (the Chairman) did not know that he had anything to dwell upon in this matter, except to add that the directors were willing to hear and answer any questions the shareholders might have to put to him respecting the present position of affairs. It was to be borne in mind that if the proprietors declined to contribute towards the 10,000*l.* which the directors had power to raise, then they asked the meeting to authorise them to dispose of the property. He might mention that they had received a proposition from Dr. Stallard in reference to this matter. Now, if the proprietors came to the conclusion that the property should be leased or sold, the directors asked them to confer on them full discretionary power. Notwithstanding the richness of the property and its vast extent, the directors had come to the unanimous conclusion that it was almost next to impossible to manage any company in America, by reason of the surroundings that were there; and however desirable it might be to raise the fresh capital and carry on the works, if the company were properly represented by some Englishman in whom the directors had implicit confidence, yet under the circumstances the board could not conscientiously recommend that such should be done.

Mr. C. TYLER said in regard to the remarks that had fallen from the various speakers in reference to Mr. Morgan that at the last meeting he had unhesitatingly expressed his full confidence in Mr. Morgan. At the present moment that confidence remained not in the slightest degree shaken, and he looked upon the stake he held in the company as secure under his management. (Hear, hear.) With regard to the sale or leasing of the property he thought they had sufficient ability on the board to guide them in the right direction, and he should be perfectly willing to leave the matter in the hands of the gentlemen forming the direction of the company.

The CHAIRMAN then proceeded to move "That the directors be authorised to negociate for the sale or leasing of the mines, mining claims, rights and property of the company, and to carry out any sale or sales, lease or leases, upon such terms as they may deem expedient, and with reference thereto, to cause the property sold or let to be conveyed or leased to the purchasers or lessees thereof."

Mr. BIRKIN, in seconding the resolution, said the directors would not act precipitately in the matter.

Mr. GREENHOW moved as a rider to the above resolution, "or to work the property as hitherto, and to borrow the necessary capital."

The CHAIRMAN pointed out that the directors had already the power the rider sought to confer, and, therefore, asked its withdrawal, on the ground of inutility and as causing delay.

Mr. GREENHOW withdrew his rider

The resolution was then put, and carried with one dissentient.

The SOLICITOR said it was necessary, according to the regulations of the Articles, that a resolution dealing with the sale or lease of the property should be passed at an extraordinary meeting, and then confirmed at a later meeting—that confirmatory meeting would be held a fortnight hence.

On the motion of Mr. C. TYLER a vote of thanks was accorded to the Chairman, and the proceedings closed.

THE AUSTRALIAN MINING COMPANY.

The annual general meeting of shareholders was held at the London Tavern, on Monday,—Lieut.-Col. GEORGE PALMER in the chair.

The report stated that at Tungkillo (special survey of 20,000 acres) the tenants of the company have had a good harvest, but the price of grain has been low. The coming season opened favourably for the preparation of the land for next year's crops, and the letters received by last mail state that refreshing rain had fallen, and that vegetation was active and promising. With regard to the question of increase of rental from March 25, alluded to in last year's report, Mr. Davenport, after a careful consideration, has made certain alterations; the aggregate, however, shows but a very small addition to the present rental—the new arrangements to be in force for five years. The directors have such great confidence in Mr. Davenport that they propose to confirm his suggestions, strongly urging him to insist, however, upon arrears being paid up. The Government of South Australia has appointed a commission to report upon a large extension of railways, and whatever the lines adopted, the works will probably greatly benefit the colony at large as well as the company's tenants; there is little doubt that there will be a line from Port Adelaide to the River Murray, but it is yet uncertain whether it will pass near to the company's Tungkillo property.

PALMER TOWNSHIP.—The purchase has only been completed of one of the four lots sold, it having been considered expedient first to register the plan of the township in the Government land office; this registration has caused delay; no fresh lettings or sales have been effected.

MINING.—During the past year scarcely any operations have been carried on either at Reedy Creek or at North Tungkillo Mines owing to want of capital and enterprise for prosecuting such undertakings. The lessees of North Tungkillo, some time since, cut into a fresh lode, but did not continue the work, and so the value of the discovery remains uncertain.—Charlton: This property continues let until Dec. 1 at 200*l.* per annum. Port Augusta, ½ acre, is let till Oct. 1, 1878, at 10*l.* per annum. On Aug. 1 the directors propose to pay a dividend of 2*s.* per share.

The CHAIRMAN said everything was going on smoothly, and in a satisfactory manner, as far as the agricultural prospects were concerned; in mining nothing had been done—there was no doubt gold and copper was there if they had the funds to work for those metals. Those who had taken the lease from the company had, no doubt, the best possible reasons for doing so, and no doubt advantageous results would be realised if they had the necessary capital. He did not know whether the shareholders would be disposed to assist those people who had erected the requisite machinery; if so, it must be done individually, and not by the company, as it had decided that no further funds of the company should be expended in mining operations. The colony was in a very prosperous state, advancing most rapidly, with prospects most encouraging. One great thing that would further stimulate its prosperity would be the completion of the contemplated railway, in addition to the line of telegraphs which was now extending north and south. The colony being prosperous, and continuing to prosper, the company could not fail to participate in the results. They were greatly indebted to the efficient management of Mr. Davenport, as well as for the intelligence he had shown in conducting many important matters. He would repeat there was every prospect of the company continuing to advance. He then moved that the report and balance-sheet be received and adopted.

Mr. FREDERICK COLLIER seconded the proposition.

Commander HENRY LAYE said that the amount paid to the directors, auditors, and for salaries was 425*l.*, and that 200*l.* was paid to Mr. Davenport, making 625*l.*, while the receipts were 3081*l.* As one director had died the present seemed a good time to reduce the amount paid to the directors.

Mr. CHARLES ISAACS had been a holder of shares for the last 25 years, and he should like if possible to define his liability thereon. He thought the present a very fitting opportunity to divide the shares into two classes, to enable those who chose to develope the mineral resources of the property. He endorsed the remarks of the last speaker, as the present expenditure was 25 per cent. of the receipts, which was a very excessive charge. By the adoption of his suggestion to divide the shares into two classes, A and B, they could be made into one denomination of security without any liability hanging over their heads, rendering the property much more valuable in the market. He did not know that he could now move a resolution to that effect—if not, he would suggest that the board should take it into their earliest consideration. The A shares could rank as 5*l.* fully paid and the B 2*l.* 10*s.* paid, subject to a further call of 2*l.* 10*s.* per share.

Mr. F. COLLIER explained that the deed prescribed there should not be less directors than five. As to the division of the shares, it happened that every shareholder—as far as the board were able to understand their feelings upon that subject—was against going into the mining enterprise. The difficulties in the way of reducing the capital were insurmountable according to the opinion of counsel and the committee of investigation appointed to consider the question.

Mr. ISAACS thought it would be a very graceful act if the board relinquished a portion of their fees,

The CHAIRMAN, in reply to a question, said that the board were very anxious to do their best for the property, and their representative in the colony was doing as much as if the property were his own private property. The last crops had been

extremely good, but unfortunately the price had fallen, but as the price had improved here a little it would, no doubt, benefit them.

Mr. ISAACS felt satisfied the agent in the colony was doing all a man could do in furthering the interests of the shareholders, but he (Mr. Isaacs) wished to ask simply as a matter of grace whether the board would not also further the interests of the shareholders on this side?——The CHAIRMAN said they were doing so.

Mr. F. COLLIER said that 200*l.* were divided among five directors, and if that were considered too much he could not concur in the opinion.

Commander LAYE proposed that the directors' fees be reduced from 200*l.* to 100*l.* Mr. Davenport and the secretary were entitled to what they received.

A SHAREHOLDER said it was extremely difficult to secure gentlemen who would devote their time for so small an amount.

The report and balance-sheet were received and adopted.

Commander LAYE then proposed that, considering the small amount of income and the large expenditure, the remuneration of the directors be reduced from 200*l.* to 100*l.*——Mr. ISAACS seconded the proposition.

A SHAREHOLDER said that, looking at the trouble the present directors had taken, and the very small amount of difference the proposed reduction would make to the shareholders, especially as they had such directors, holding such a large stake in the company, he would appeal to the mover and seconder of the motion to withdraw it.——Commander LAYE said he was perfectly willing to leave it in the hands of the directors.

After some discussion the proposition was withdrawn.

Lieut.-Col. Palmer and Mr. F. Collier were re-elected directors, and Alderman Sir Charles Whetham was elected a director, in the room of Mr. Wotton, deceased.

The auditors were re elected.

Upon the proposition of the CHAIRMAN, seconded by Mr. ISAACS, a unanimous vote of thanks was passed to Mr. Davenport for his valuable services as agent in the colony.

GROGWINION LEAD MINING COMPANY.

The half-yearly general meeting of shareholders was held at the Cannon-street Hotel for the purpose of receiving the directors' report and balance-sheet for 10 months, ending June 30, the delaration of a dividend, and for the doing and transacting of all such other business as may be incidental to the business of an ordinary general meeting, Capt. ROSS, F.R.G.S., in the chair.

The report of the directors congratulated their co-proprietors upon the continued prosperity of their mine as evidenced by the sales of ore, which, in November last, increased from 40 to 50 tons every four weeks, and on July 7 from 50 to 70 tons for four weeks, and this increase will be still further augmented by about the close of the present year. The present satisfactory position has been attained without in any way forcing the resources of the mine, and is a pleasing accomplishment of the predictions made from time to time concerning the productiveness of the mine. The ore sales for the 10 months ending June 30 have been 480 tons, realising a gross value of 7094*l.* It is not thought to be advisable that the sales of 70 tons every four weeks should be further increased until the shaft, which is now in communication with the intermediate level, shall have been communicated with the deep cross-cut level driving north, and this will probably occupy, with the necessary drivages, about six months from the present time. The cost of working the mine is somewhat heavier than was expected. The directors are giving their best attention to the matter, and will, as the opportunity offers, make some improvements in their dressing machinery, which will tend to economise cost; but, until the communication referred to is completed they cannot make any great saving. The accounts include all items outstanding and fairly chargeable against revenue. The propriety of declaring a dividend will be left to the shareholders to decide.

The report of the manager, Capt. Kitto, referred the shareholders to the one presented at the last ordinary general meeting, and by comparing the two it will easily be discovered what progress has been made since that date, and the amount of work that has been accomplished towards the fuller development of the property. At the date to which he referred the main shaft had been sunk to the 24 fm. level, below the shallow adit, and the greatest anxiety at that time was to get a communication effected between this and the intermediate level. He is pleased to say that this communication has been made, good ventilation has been secured, and increased returns of lead have been the result. The progress made in opening out the mine since the last meeting may be gathered from the following facts:—The shallow adit level has been driven east 26 fms., and has been communicated with the shaft in the eastern ground. The 12 fm. level has been driven east of main shaft 28 fms.; the 24 east 36 fms., and west 20 fms.; the 36 east 9 fms., and west 22 fms.; and the intermediate level east 30 fms. The main shaft has been sunk from the 24 to the intermediate level, a depth of 22 fms., and four winzes between the 12 and 36 fm. levels, measuring together about 48 fms. These winzes have been sunk for the purpose of ventilation, and for opening out the ground for stopes. In the meantime they have stoped from the backs of the different levels 416 fms. of ground, and have raised and sold 480 tons of ore, or, allowing for that obtained from the drivages, &c., an average yield of about 1 ton of lead ore to the fathom. This he considers a most satisfactory result, and could only be obtained by a thorough practical development of the works. There have now been opened out, and in reserve, in the different levels (including 10 fms. below the intermediate level) about 1100 fms. of ore ground, to say nothing of what exists eastward under the old workings, or between the intermediate and deep adit levels; but, judging from what has been already done, and from the discoveries that have been already made, particularly above the deep adit, he has not the least doubt that this, on being more fully developed, will prove equally as productive and profitable as any of the present operations, and as a proof of this he adds that the rise above the deep adit, which is now up more than 20 fms. towards the intermediate level, has been in good ore ground ever since it was commenced, and still continues as productive as ever. They are at this point badly off for ventilation, and, consequently, progress is comparatively slow, but in about three weeks from now they will be in a position to commence sinking the main shaft below the intermediate level, and immediately over the rise above referred to, and in about eight months from this date he hopes to get a communication through, which will ventilate the whole mine, and will enable them to reduce considerably their dead charges by concentrating the whole of their dressing operations on to the main dressing-floors, and by bringing the whole of the stuff from both sections of the mine direct to the same through the deep adit level. He might call attention to the fact that the 12 fathom level would have been driven much further into the eastern ground than it has been but for the reason given in his last report—the fear of letting down the water from the winzes which had been previously sunk below the shallow adit (see plan), but immediately the communication was made with the intermediate level the driving of the 12 was resumed, and he is glad to say the whole of this water has been drained without the slightest accident, and without interfering in the least with any of their other operations. In driving the shallow adit level into the eastern ground they found it to be too near the surface to become profitably productive, and he considered it advisable to suspend this driving, and put on full force in the deeper levels, and they have now four headings in full driving towards the eastern section of the mine—the 12, 24, 36, and intermediate—all of which will be carried on simultaneously, and will enable them to develope the eastern ground much more rapidly and economically than they could possibly do by continuing the driving of shallow levels, or by any amount of surface operations. They have commenced to sink a new shaft on No. 1 lode, considerably to the east of the deep adit level cross-cut, but, so, far, the ground has been soft and troublesome, and requires to be close timbered; he hopes, however, to get into a firmer class of rock shortly, when greater progress will be made, and the general character and producing qualities of the lode better and more satisfactorily ascertained. In concluding his report he has much pleasure in being able to state that the prospects have continued steadily and satisfactorily to improve, and the reserves of ore ground have gradually increased. They have now, as stated above, 1100 fms. of stoping ground already opened out and available, and this should yield at least 1100 tons of lead ore, or a money value of about 15,000*l.* This is irrespective of ore ground lying between the intermediate and deep adit levels, which will soon be available, and which will add very much to the above estimate. They have increased their returns from 50 to 70 tons per month, and when the communication (above referred to) has been made between the intermediate and deep adit levels he has no doubt they will be able to make a further advance, and shortly afterwards he hopes to increase it to 100 tons per month.

The CHAIRMAN said the present was the first of the semi-annual meetings, which in January last it was decided should in future be held for the purpose of disseminating information about the mine, and affording such other additional information as shareholders might desire as to the general condition of the enterprise. The accounts now submitted embraced a period of six months, and their form somewhat differed from that hitherto adopted. The amount applicable for dividend was not large, but there were the most solid reasons to believe that in future—and that at no distant date—dividends of an increasing amount would begin to be declared. As the fund now available for dividend was somewhat smaller than on former occasions, he might be permitted to explain in what way the difference had arisen. He would preface his assertions by stating that the amount it was proposed to recommend upon the present occasion would, it was fully believed, be the smallest ever set forth for the consideration of the shareholders. It was simply for this reason—they had not long been in the enjoyment of a revenue account—it was new to them and their accountant, or rather bookkeepers, who had prepared the accounts, were unacquainted with mining details; the result was there were several items about which he should give some more detailed information. The item of 416*l.* for mine stores, investigation had told him should have been largely written off last year—it represented goods purchased for the miners, and deducted from the cost. With the view of charging up everything as closely as possible, the item of 591*l.* had been included for directors' fees. Some shareholders had done him the honour of writing to him expressing surprise the directors had taken this sum for 10 months' services, but if those gentlemen were capable of reading the accounts placed before them it would be insulting to their understanding if he were to offer further explanation. There had been written off 300*l.* for the vote passed at the last meeting for the directors fees, and 300*l.* in respect of mine stores; those two items would have amounted to a dividend of 8d. per share upon the present occasion, but inasmuch as that dividend had already been actually paid, it was not possible to pay it twice over. These figures when reflected upon, though reducing the current dividend, showed the company was not by any means in the impecunious condition which some honourable proprietors, who were absent, would seem to think. He then proceeded at some length to review several of the principal items in the balance-sheet, and congratulated the shareholders upon the even price maintained for the sales of the produce since December. At the last meeting it was decided to pay a dividend of 1s. 4d. per share, he at the time strongly objected to the payment of that dividend, and suggested the formation of a reserve fund; he was, however, out-voted, and it would be for the shareholders to decide to-day what should be done with the balance now available for dividend. The directors felt themselves perfectly justified in congratulating the shareholders upon the continued prosperity of the mine; to use the words of Shakespeare their "prosperity now began to mellow," and there was no doubt it would continue "to mellow," as the sales and profit would soon increase. They had, indeed, increased two months earlier than Mr. Sopwith told them would be the case, as they commenced in June with 70 tons, and sampled last Saturday 70 tons; that quantity would be maintained monthly until further increased to 100 tons; and as the fixed or dead charges would remain nearly the same, the net divisable profits would be augmented in a much greater ratio than the proportion of the increased output. (Hear, hear.) Besides this, the working cost was now much heavier than it would be presently, which he would endeavour to make plain by means of the plan on the wall. He pointed out that until the shaft had been sunk to the base of the hill an extra charge would continue to be paid for tramming, which, added to other abnormal expenses, represented a considerable difference in the dividends. They, the directors of the company, also intended to avail themselves of some of the important improvements now being applied to dressing machinery, which would reduce by two-thirds the manual labour employed on the old machinery, although much of it was already self-acting. The important work of sinking the shaft from the base to the summit of the mountain had necessarily occupied considerable time, and incurred a large expenditure, but the results to be permanently realised would satisfy the most sanguine. He represented upon this occasion 5080 shares, but there were a few gentlemen who had favoured him with communications to whom he wished to point out that mining was a work of time. Some people evidently thought that directors of a mine were like a fairy in the pantomime, possessed of the power of changing reserves into dressed ore by just moving her wand, and immediately changing the same. He advised shareholders to go and look at their property, and they would directly see that such suggestions as those he had alluded to were impossibilities. He only asked for a little more patience, and he was satisfied that the dividends to be paid in the future would satisfy every shareholder. He then moved that the reports and balance-sheet be received and adopted.

Capt. C. SIMMONS seconded the proposition.

An unimportant discussion then arose between the two auditors as to the form in which the accounts should be submitted.

Mr. JOHN KITTO (the manager), in reply to questions, stated that the increased return of 100 tons per month would not augment the cost more than 100*l.* per month.

A SHAREHOLDER asked what profit would be realised by an output of 100 tons per month?——Mr. KITTO: Between 600*l.* and 700*l.* per month. He believed that would begin from April next. It would take about eight months to make the communiction between the intermediate level and the deep adit level, and he could not promise any further increased returns until that had been done.

A SHAREHOLDER drew attention to the disparity between the estimate of reserves made by Mr. Kitto and Mr. Sopwith. Mr. Kitto had computed the amount at 1100 tons, while Mr. Sopwith had stated the ore in reserve to be 2000 tons.

Mr. KITTO said there were two ways of valuing the reserves. Mr. Sopwith and some others had valued the ground that had not yet been thoroughly opened. He (the manager) believed both estimates were correct; he believed Mr. Sopwith had valued the reserves between the intermediate and the deep adit level which he (Mr. Kitto) had not done. In that case, he believed the reserves would very far exceed Mr. Sopwith's estimate. He (Mr. Kitto) had estimated only that ground that had been entirely opened.

The motion adopting the report and accounts was put and carried unanimously.

A dividend of 1s. per share was declared.

The auditors were re-elected.

A vote of thanks to the Chairman and directors closed the proceedings.

SOUTH WARD MINING COMPANY.

At a general meeting of shareholders, held on Wednesday (Mr. R. MCCALLAN in the chair), the accounts for three months ending June 12 showed an estimated balance against the mine of 698*l.* 4s. 3d.

The accounts having been passed and allowed, the CHAIRMAN said that he much regretted the absence of Capt. Goldsworthy, who had been suddenly called home in conseqnence of the unexpected death of a friend; but as his report of July 26—a copy of which is appended—containing all details respecting the progress made in developing the mine would be submitted, and the plans were on the table, shareholders present would be able to see what their actual position was at the present moment. It appeared there were two very important points of operation which should be well tried before any decision was arrived at with regard to the future conduct of the mine, and he would recommend the shareholders to persevere a short time longer to see what results may accrue from the cutting of the lode in the 90 east, and driving the 72 south. He had been informed that four months would, probably, suffice to prove these two ends, which would not involve a cost of more than 125*l.* per month, as it was determined to suspend all other operations for the time, and he hoped the adventurers would give their consent to the trial being made, and that at the next meeting, to be held in November, he would be able to report that their determination had resulted in important discoveries being made.

The agent's report was as follows:—

July 26.—Since the last general meeting the 90 cross-cut has been extended east 11 fathoms, the same level north on the flookan lode 12 fms. 4 ft. 6 in. The 72 north, on North Hooe lode, 16 fms., and south at this level 13 fms. 6 in. The 60 cross-cut east 9 fms. 1 ft. 6 in. A winze and rise put through from the 60 to the 72, and in a trial adit level 13 fms. 4 ft. Total driving, sinking, and rising, 87 fms. 3 ft. 6 in. In driving the 90 cross cut we have intersected several cross joints or heads. Most of them have been highly impregnated with lead, which looks well for the lode when intersected being found productive. In the 72 south the lode is 3 ft. wide, composed of flookan, spar, prian, capel, and mundic, a very strong, promising lode. The lode in the same level north is about 2 ft. 6 in. wide, a very strong lode, but unproductive at present. In the 60 cross-cut east we have intersected three flookans, all dipping west. In the trial adit a branch about 6 inches wide, composed of quartz and flookan, with spots of mundic, has just been met with. This branch is underlaying west 3 ft. in 1 fm. The adit level, 60 fm. level cross-cut east, the 72 north, and the 90 north are all suspended for the time, in order to keep the costs as low as possible pending the intersection of the lode in the 90 cross-cut, and the 72 south passed through in the 60 above, and where, judging from its appearance, there is every reason to expect a richer lode and of greater length. To expedite the development of these two points there are eight men in each bargain working continuously from 2 o'clock Monday morning until 10 Saturday night. The engine and machinery are all in good order and working well.—R. GOLDSWORTHY.

Mr. LAWS stated that he had an interview with Capt. Goldsworthy yesterday for half-an-hour, and he strongly urged the importance of continuing operations with a view to cut the fine lode gone through in the 60 above, in the 90 cross cut; and as the 72 south showed every indication of an improvement he recommended that all the force should be employed to push on that end with all speed.

A SHAREHOLDER spoke very highly as to the future prospects of the mine, and advised the adventurers to persevere in driving these ends. The 90 cross-cut would prove the value of the lode ere long, and there was scarcely any doubt whatever but that at this level and in depth a large and profitable mine would be in the hands of the shareholders. Most of the mines in the neighbourhood had made their large masses of ore at or about the 90, and he could not but think that equally as good a property as those that had gone before remained in South Ward.

To meet the adverse balance it was resolved to make a call of 6s. per share, making altogether 5*l.* per share, as paid upon the shares in which the mine is divided. It was stated that 185 shares were forfeited at the last special meeting, and the secretary was authorised to take such legal measures as may be necessary for recovering the calls due.

A vote of thanks to the Chairman terminated the proceedings.

PRINCE PATRICK LEAD MINING COMPANY.

The half-yearly meeting of shareholders was held at the office of the company, Seel-street, Liverpool,—Mr. J. WALKER in the chair.

Mr. THOMAS HUGHES (the secretary) read the notice convening the meeting. The directors' report was read, as follows:—

The directors have much pleasure in again meeting the shareholders at the close of another half year, particularly as they are in a position to place before them so favourable a balance-sheet. It will be seen that all accounts due by the company up to June 30 have been brought forward, including the month's costs, payable on the 17th instant. It will also be seen that after paying off all liabilities, there will be a balance in favour of the company of 3458*l.* 16s., and after deducting from this the dividend which was paid on the 9th inst., there will be left a balance of 1340*l.* to be carried over to the next account, and this independently of the amount of 550*l.* 5s. due on capital account. The directors trust that the financial position of the company, as shown by the balance-sheet, will give satisfaction to the shareholders. The directors are pleased to state that the mine has greatly improved during the past six months' working, and they have much pleasure in referring the shareholders to the captain's report, which is now before the meeting, and which fully explains the various workings, value of the lodes, &c. The directors are glad to state that there has been an increase in the sales of ore for the last six months as against the previous half-year's sales of 37 tons, and also an increase in the cash returns of 737*l.* 12s, which, together with the care and economy observed by the manager and by the captain of the mine, have enabled the directors to increase the last dividend from 20 to 25 per cent., and to carry over to the next account a much larger sum than heretofore. Judging from the valuable appearance of the lodes and the general improvement of the mine, the directors can with confidence repeat the statement made in their last report—viz., that the Prince Patrick Mine is only in the infancy of its prosperity, and that they feel sure they will soon be in a position to pay quarterly dividends at a considerably increased rate. It is with very much regret that the directors have to mention that they have lost one of the members of the board (Mr. Richard Barker), who died recently. He was a sterling supporter of the mine, and his loss is deeply regretted by all the shareholders who were acquainted with him. It will be for this meeting to elect a member to take his place on the board. One of the directors, Mr. William Morton, retires by rotation at this meeting, and being eligible offers himself for re election.

The agent's report was read, as follows:—

July 20.—In looking over our progress at this mine during the last six months working, I am pleased to say that, on the whole, it has been most satisfactory, and the various lead-producing ends have maintained their usual richness, and yielded their amount of ore very regular, according to the quantity they were hitherto valued at, with the exception of the 100 south-west, driving upon the great lode. This level fell off a little, as I intimated to you in a former report, in value per fathom, yet the lode in the forebreast is still as strong as ever. We found it yielding some good dressing stuff, with every indication to lead us to expect a new and great discovery before long. The three stopes in this lode and level are much the same in value for lead as they have been for a length of time, and will each average 3¼ tons of ore per fathom. The 100 level, driving south of Campbell's shaft, is close upon the line of Fairclough or new lode, and some strong branches of ore met with often running direct east and west, which fact is a good omen that the said lode will be found productive when intersected. The 115, going south upon the great lode, has reached the bearing ground, and is improving gradually in value every fathom we drive, and I anticipate that a fine course of ore is ahead of this level. Every indication points to this, and I shall be much disappointed if we do not meet with good results here soon, as we have already a good leader of ore to follow. The 115 fm. level driving north is not gone far enough from the influence of the Pant lode to lead us to expect any produce, yet the ground is mineralised all through, and looks more favourable for lead as we gain length northward. The 140 west, on the Pant lode, is suspended for awhile, and left well worth 1½ ton per fathom for the whole length of the stope. The 170 east on this lode is gradually softening, and shows that we are getting out of the hard bar, and that the lode will become productive before long. The 170 west has greatly improved since my last monthly report, and is opening into a fine course of ore, and by all appearances it is a splendid lode all through, worth at present 3 tons to the fathom, with every prospect of an increase in value. We have abundance of virgin ground before this level, sufficient to make a mine itself, and if it will only continue as it is now it will prove to be an important new feature in Prince Patrick Mine. The dressing is going on regularly as usual, and we have delivered the last 50 tons sold. The mine and machinery are all in good repair and working order.—JOHN LLOYD.

The CHAIRMAN said that it afforded him very great pleasure to preside at this meeting, and to see by the reports that the mine was carrying out all their expectations. The developments that had been made since the last general meeting proved that the ore-bearing ground continued to a great depth, and, moreover, there had been discovered several independent lodes that would, undoubtedly, return large quantities of ore. The directors had been enabled to increase the last dividend, and he had no doubt that for the future they would be in a position to pay quarterly dividends at a further increased rate. He had much pleasure in expressing his confidence in the skill and ability of their agent, Capt. John Lloyd, and of their managing director, Mr. T. Hughes, who had by their untiring efforts brought the mine to so successful a position. In conclusion, he would beg to move that the accounts and balance-sheet, together with the reports, as presented, be received and passed.——The proposition was seconded by Mr. COOMBE, and carried unanimously.

After sundry questions from some of the shareholders relative to the reserves of ore, prospects of the newly-discovered lodes, &c., all of which were replied to by the captain, to the entire satisfaction of the meeting, Mr. RULE proposed that the retiring director, Mr. William Morton, be re-elected for the ensuing year, which was seconded by Mr. JOHN COOMBE, and passed.

It was proposed by the CHAIRMAN, and seconded by Mr. COOMBE, that Mr. D. P. Rule be elected a director in the room of the late Mr. Richard Barker, which was carried unanimously.

The CHAIRMAN said he felt great pleasure in proposing a vote of thanks to their managing director, Mr. Timothy Hughes.——The proposition was seconded by Mr. ALEXANDER RULE, and carried unanimously.

A vote of thanks to the Chairman terminated the meeting.

WEST GOGINAN SILVER-LEAD MINING COMPANY.

The fourth ordinary annual general meeting of shareholders was held at the offices, Lothbury, on Tuesday,—Mr. HILTON in the chair.

The SECRETARY read the notice convening the meeting.

The report of the directors stated that since the meeting held in January, when a full and complete statement of the condition of the property was made, every possible means has been adopted for the further advance of the working of the mine, and, the necessary capital having been provided, the difficulties alluded to at that meeting have been removed. It will be remembered that a committee of shareholders was formed, who, after carefully investigating the property, were so satisfied with the prospects of success that they unanimously recommended that the existing shareholders should be offered the remaining shares of the company. The directors have much pleasure in stating that, in answer to that recommendation, the whole of the unallotted shares were subscribed for, thus enabling them to supply Capt. Kitto, the manager, with all that is necessary for the complete development and vigorous prosecution of the works on the mine, as detailed in his report, herewith appended.

The report of Capt. John Kitto (the manager) stated that the main engine-shaft is now down about 10½ fms. below the 12, and will be completed to the required depth for a new 24 fm. level in about three weeks from this date, when we shall immediately commence to drive out both east and west on the course of the lode, which I am pleased to say still continues to yield very good ore. We have not yet cut through the lode in order to ascertain its full size and value, as to do so would greatly interfere with the sinking, and since we resumed operations our object has been, and still is, to reach the 24 fm. level with as little delay as possible. You cannot fail to observe, however, that only about 2½ fms. have been sunk since the meeting held in January last, but you are, of course, aware that this is in consequence of having cut the strong feed of water in the east end of the 12, referred to in my report for that meeting, and to the want of funds to enable us to erect the necessary machinery for draining the same, but this has now been temporarily overcome by the fixing of a portable steam-engine, which will pump the water and draw the stuff from the mine until the new machinery is erected for the permanent working and full development of the property. The 12 west has been cleared and repaired which broke down during the time the mine was full of water, and shall immediately resume the driving of the same, but he does not propose to drive the same level east, for fear of further increasing the water, until the engine-shaft is completed to the 24, and a lift of pumps fixed in the same. They are busily engaged at present in making preparations for erecting the necessary machinery for pumping and drawing, as well as for crushing and dressing the ores, and the parts that have to be made new have been ordered, and are already in course of making, and no time shall be lost on his part in getting the same completed and in operation, and the first parcel of ore ready for market.

The CHAIRMAN said the shareholders had been so recently fully informed of the condition of the mine that it was scarcely needful for him to add much on the present occasion. He was glad to see present some shareholders who had made themselves fully conversant with the condition and prospects of the property, and also their able manager, Capt. Kitto, who would gladly answer any question that shareholders would wish to ask upon the subject. He then moved that the report and balance-sheet be received and adopted.

Capt. HILL (a director) seconded the proposition. It would be scarcely necessary he thought to draw the attention of shareholders to that portion of the report of the directors which states that "all the difficulties had been removed." The difficulties were not stated, but it would be within the knowledge of those who had followed the course of events that those difficulties appeared at one time insuperable, and it had been only by the steadiest working, and by the greatest assistance on the part of some shareholders, that at length those difficulties had been removed. He reverted to the time when it was stated that capital was sufficient to bring forward such results as to leave no difficulty in raising the remainder of the capital. The directors at that time in a great measure relied not only on the reports of their very excellent manager, but upon the personal observation of their late Chairman, and the results justified the directors appealing to the shareholders to take up the unalloted shares. Before doing so, however, they called upon another independent engineer, Capt. Paull, whose report was forwarded to the shareholders. Capt. Paull bore the strongest testimony to the intrinsic value of the mine. The unallotted shares were offered, and certain responses were made, but not sufficient to justify the directors to issue them. A committee of shareholders was formed, and their recommendation as to the way in which the shares should be placed was at once adopted, and with that success which had justified the directors stating in their report that the "difficulties had been removed."

Mr. ATWOOD drew attention to the costs and the expenses of management.

Mr. HESELTINE explained that the management expenses appeared large on account of the actual working having been for some time exclusively restricted to the sinking of the shaft and driving levels.

Mr. ATWOOD thought the expenses under Capt. Kitto were very fair, and he fully believed the mine was being conducted economically and efficiently.

Capt. HILL reminded the hon. proprietor that had the working costs been five times as much, the management expenses would have been the same.

The SECRETARY explained that the manager received 100*l.* per year, the resident agent 50*l.*, and himself 120*l.*, including office rent, clerks, &c.

Mr. ROSS thought the shareholders should know whether these expenses were to be in the same ratio in future, or whether there could not be some amelioration of the burden which bore on their backs so heavily.

Mr. HESELTINE said although when set forth in one item the aggregate appeared somewhat formidable, yet taken separately the charges were extremely moderate. The directors received 200*l.* a-year, or 50*l.* each.

Mr. ROSS said had there been appended to the balance-sheet a profit and loss account these several items would have set out, and enquiry rendered unnecessary.

Mr. HESELTINE replied that the directors had deferred issuing a profit and loss account until an actual profit had been realised.

Capt. KITTO said that the main features of the mine were dealt with in his report now before the meeting. He might add, however, that the main shaft, which was the principal point of operation, had been sunk 10½ fms. below the 12, and when down to the 24 it was proposed to drive out on the course of the lode to prove its quality and size. It would be necessary, however, to sink below the 24 some 4 or 5 ft. for a "fork;" that would take a week or ten days, when they would immediately cut "lodge" and open out on the course of the lode. They were carrying only a small portion of the lode in sinking the shaft, as in consequence of its vughy character it was impossible to sink in the lode itself. The part of the lode they were carrying was very good, producing a very fair proportion of lead. As the remainder was left standing on the footwall of the shaft he could not tell its width, but it was as good there as in the other part. The 12 fm. level east and west

had been driven very little since the last meeting, in consequence of having cut a sudden feed of water, and not having machinery to pump it out. That difficulty, however, had now been overcome by the fixing of a portable steam-engine and a small water-wheel. At present the water was being passed out by means of the wheel alone, but preparations were being made for the erection of more powerful, substantial, and efficient machinery for the full development of the mine. One wheel would be used for the purpose of pumping water from the river into the reservoir, and the larger wheel would still be used to pump and draw and crush the stuff from the mine. The bad weather had prevented further progress having been made with the surface works. The reservoir was in course of construction, and he hoped in about four months to have the whole thing in operation. After that he would be able to make returns of ore; in the meantime the 24 fm. level would be advanced sufficiently far to enable them to lay out stopes, and he hoped by that time to be in a position to make regular sales of lead. They would begin with about 15 tons per month, which would pay the monthly costs. Judging from the present appearance of the mine, he had no doubt the sales would be regularly and, he thought, satisfactorily increased. Altogether, he considered the prospects of the mine exceedingly encouraging: a better lode, or a lode of greater promise, he had not seen for a considerable time, especially at so shallow a depth.

Mr. ATWOOD (the largest shareholder in the mine from its earliest commencement) had great pleasure in bearing testimony to all that Capt. Kitto had stated. He frequently visited the mine, and was there recently. He knew the lode was a very large one, and if it should turn out as it promised they would have to congratulate each other upon possessing a valuable property.

After some further discussion the report and balance-sheet were received and adopted.

The election of Mr. Brooks as director was unanimously confirmed.

It was resolved and carried unanimously that ordinary meetings of shareholders be for the future held half-yearly, and that the accounts be made up to Dec. 31 and June 30.

Mr. Wyon was re-elected auditor.——The two retiring directors were re-elected.

A vote of thanks to the Chairman and directors closed the proceedings.

LEVANT MINE.

At Levant, on Tuesday, a sixteen-weeks meeting was held on the mine, St. Just,—Mr. EDMUND DAVY, Penzance, in the chair.

The CHAIRMAN said that the position of the mine was not so bright as when they met four months since. Then they were in a position to pay costs, but now they were exactly the reverse. The labour cost for this quarter had been 3151*l.*; merchants' bills, 342*l.*; coals for the quarter, 497*l.* The total disbursements for the four months were 4041*l.*, and 2895*l.* worth of tin had been sold. The sampling of the copper ore had been postponed for a week; its estimated value was 500*l.* The balance against the adventurers on the last account was 1036*l.* A call of 4*s.* per share had realised 500*l.*, showing a debit balance of 576*l.*, which, added to the previous balance against the adventurers, made a debit balance of 1245*l.*

Capt. HENRY BOYNS (the manager) stated in his report that the estimated quantity of tin that they could raise in the next sixteen weeks would be 50 tons, and about 250*l.* worth of copper, which would leave a loss of 200*l.* per month. They had cleared and made accessible for working five miles of levels, and between three and four miles of tramroads. During the last quarter they had raised more tin and copper than they had in the same time before, but not so much as they had expected at the last meeting by 600*l.* worth. There were two causes for this. The mine had fallen of in value in several places, and all just at one time. The other cause was the reduction in the price of tin.

The question of what should be done to meet the great deficit was discussed.

Mr. QUICKE moved that a call of 4*s.* should be made; a heavier call would, he thought, be injurious to the mine.

Mr. READ asked if the Chairman had any proposition to make?——Capt. R. BOYNS, as one of the committee, thought that steps should be taken by the adventurers.

The CHAIRMAN suggested that a heavier call should be made.

Mr. HARVEY thought they should look boldly at the difficulty, and he moved that a 10*s.* call should be made, which Mr. WELLINGTON seconded.

Mr. W. J. COCKING would vote for the engine only being kept agoing.

Mr. READ remarked that the report was far less encouraging than the previous one; and Mr. QUICKE thought there might be a reason for giving a bad report.

Capt. BOYNS was not aware why the report should bear such a character. A small call should be made.

Capt. PENTREATH did not see why they should go on with a 10*s.* call while another 10*s.* call stared them in the face.

Mr. QUICKE thought that as 50,000*l.* had been spent on the mine, and it was well equipped, it would be an act of madness to shut it up. He withdrew his proposition for a 4*s.* call, and proposed that a call of 7*s.* 6*d.* should be made.——The 7*s.* 6*d.* call was agreed to, Mr. Harvey's proposition having been withdrawn.

A circular signed by Messrs. R. Quicke and N. Douglas, committeemen, complaining of the management of the mine, was next considered. The particular cause of the complaint was the connection of Captain Henry Boyns with the mine.——The CHAIRMAN defended Captain Boyns, stating that he had managed Levant Mine as well as any mine in Cornwall had been managed, and they could not find a better dialler, mine agent, and captain in the county for a mine situated like Levant. The Chairman also hinted that he should resign his office as committeeman.——Mr. QUICKE complained of Captain Henry Boyns on the broad principle of incompetency.——Captain RICHARD BOYNS supported Captain Henry Boyns, remarking that the mine would come to grief all the sooner for removing him.——Captain HENRY BOYNS said he felt that he could not continue in his present office while he had not the confidence of the whole committee, and, acting upon the advice of his friends, he had resolved upon resigning, and he forthwith tendered his resignation. He entered at some length into what he had done, in vindication of his character against the charges made by Mr. Quicke, and stated that in two years, out of 20,000*l.* called up, 14,917*l.* had been spent in materials. From the commencement 25,000*l.* worth of mineral had been raised. The underground tut and tribute men averaged 5*l.* worth of mineral per man per month, and the average price of tin was about 60*l.* per ton. They had succeeded in fixing a plant and machinery to work on economical principles equal to any mine in the county, and 30 per cent. cheaper than the former working.

Mr. QUICKE said the largest adventurers were very much disgusted with Capt. Henry Boyns's conduct, and he was very happy to find he had resigned.

Capt. RICHARD BOYNS (of Wheal Owles), as a committeeman and as an adventurer, considered that Capt. Henry Boyns had been very improperly treated, and he entered his protest against it.——Mr. QUICKE replied that every man had a right to enjoy his own opinion.

Mr. QUICKE afterwards used some rather hard language against Capt. Henry Boyns, which both Capt. Richard Boyns and Capt. Henry Boyns resented, and which to some extent was also resented by Mr. Harvey (Hayle). Eventually it was resolved to advertise for a managing agent.

About 40 tons of tin were sold for this account, averaging 51*l.* 9*s.* per ton. The profit on the 16 weeks was 57*l.* The cash at their bankers is 259*l.*; and no charge appears in the printed accounts for "interest and commission."

The agents' report states that the usual quantity of tin may be expected to be raised during the coming 16 weeks, but whether at a loss or profit will depend entirely upon the price obtained. They intend to work as economically as possible, and hope for better days.—*West Briton.*

[For remainder of Meetings see to-day's Journal.]

FOREIGN MINING AND METALLURGY.

Business in copper at Paris has been rather limited, and prices have been comparatively feebly supported. Chilian in bars has made 86*l.*; ditto, ordinary descriptions, 85*l.*; ditto, in ingots, 90*l.*; English tough cake, 89*l.*; and pure Corocoro minerals, 85*l.* 8*s.* per ton. At Havre there has been comparatively little business in copper, and quotations have been, to some extent, nominal. Chilian, first marks, have made 85*l.* to 86*l.* per ton; and Lota and Urmeneta, 84*l.* per ton. The Marseilles copper market has presented a tolerably firm appearance. The aspect of the German copper markets has experienced very little change. At Rotterdam, tin has been very quiet; disposable Banca has, however, been scarce, and holders have refused to sell below 50 fl. Some sales have taken place of disposeable Billiton at 47 fl. to 47½ fl.; at the last dates there were offers at this latter price, but purchasers made default. Tin quotations have been tending downwards at Paris; Banca, delivered at Havre and Paris, has made 91*l.*; Straits ditto, 85*l.*; and English, delivered at Havre or Rouen, 89*l.* per ton. The German tin markets have been rather weak. The Paris lead market has been pretty well sustained. French lead, delivered at Paris, has made 22*l.* 10*s.*; Spanish, delivered at Havre, 22*l.* 8*s.*; English, delivered at Havre, 22*l.* 4*s.*; and Belgian and German, delivered at Paris, 22*l.* 10*s.* per ton. The German lead markets have been generally firm. Quotations for zinc have ruled tolerably firm at Paris, although transactions have presented no great activity. At Marseilles there has been little or no variation in zinc. The German zinc markets have continued firm.

Iron appears to have attained its lowest price at Paris, and a serious decline in quotations is no longer regarded as possible. Orders come to hand in rather small numbers, and they have no great importance; they are sufficient, however, to maintain a small current of business. The Parisian works producing iron for building purposes are favoured with a few orders; these orders are always, however, for immediate execution; the *rara avis* of the moment is a large order, with deliveries spread over a lengthened period. In the St. Dizier district little firmness is remarked in quotations, which are nearly the same as those recently current. In connection with the French budget for 1876 we may note the fact that it is proposed to expend 12,920*l.* in that year in the purchase of metal for the French Government foundries, and 12,680*l.* in the manufacture of projectiles. As regards the French navy, we observe that 1,200,000*l.* is proposed to be expended next year in new constructions, and 1,000,000*l.* in repairs.

To give some idea of prices in Germany, it may be said that at the recent opening of some tenders for the supply of different articles to the Alsace-Loraine railways, the following quotations were made:—300 locomotive tyres, in cast-steel, at 21*l.* 12*s.* 6*d.* per ton, by the Bochum foundry, while the Hœrde Steelworks offered the quantity required at 15*l.* 4*s.* in Bessemer steel: 50 axle bars, in puddled sheet, for tenders, were offered at 12*l.* 4*s.*, delivered by the firm of Dietrich and Co. With regard to another contract for the Upper Silesian railways, the following offers were made:—306 tyres, in cast steel, for locomotives and tenders, at 19*l.* 15*s.*, by the Ruhrort Steelworks, while the Hœrde Steelworks obtained two contracts for the supply of 3020 puddled steel tyres for carriages, at 13*l.* 12*s.* 6*d.* per ton, and for the supply of 200 carriage wheels in forged iron, without tyres, at 1*l.* 18*s.* 2*d.* each.

The French coal trade does not present any animation, but still the downward tendency in prices appears to be checked. There is an impression that the next season will be a little less unfavourable than the former one. Certain concessions may perhaps still be made, but there is a feeling that present rates will not experience much reduction. The season of the year has now arrived at which the sugarworks lay in their supplies. At Paris the coal market is tranquil, and transactions have languished to some little extent. M. Krantz, on behalf of the Channel Tunnel Commission, has presented his report on the establishment of a submarine railway tunnel between England and France. The National Assembly has adopted a bill relating to the improvement of the canals of the department of the Nord. The departments of the Nord and the Pas-de-Calais will advance between them 236,000*l.* to the State for the execution of works required for the improvement of the canals of Bourbourg, Neufossé, Calais, the River Ad, and the Upper Scarpe. The Nord advances 140,000*l.*, and the Pas-de-Calais 96,000*l* The State will pay 4 per cent. per annum upon this advance, with 4 per cent. per annum for sinking fund, so that the advance will be re-paid by 1892.

The Belgian coal trade has presented, upon the whole, little change, and until September arrives no improvement is expected to be witnessed in affairs. Stocks in the Mons basin have nearly returned to the level at which they stood before the late strike, although deliveries have been made to a certain extent. At Charleroi the demand for industrial qualities of coal has been almost *nil*, but there have been some contracts for domestic qualities. Freights have fallen. In the Liége basin the coal trade has been very quiet; some colliery proprietors are selling at cost prices, and even below them. The attention of colliery proprietors is being devoted more and more to the means of reducing the cost of production, and especially in a reduction in their expenditure for labour. In many collieries in the Liége district the miners are now only working five days out of six; they might then, probably, earn higher wages even if some reduction were made in the rates paid them per day. The men are not likely, however, to agree to such a reduction.

Iron has followed the downward course which pig has exhibited for some time past. Present quotations still leave a certain profit to the rolling-mills, and they are not expected to go lower. Large orders are scarce; the works producing plates are, however, readily disposing of their production, which is in demand on English account. Orders for merchants' iron do not arrive very freely, and the same may be said of iron for building purposes, although this is the period of the year when builders are usually employing the most iron. The Provincial Council of the Limbourg is endeavouring to obtain a suppression of Customs duties upon the northern frontiers of Belgium, and the establishment of a Customs Union between Holland and Belgium. The town of Beaumont is making arrangements for holding an industrial exhibition in September. The shares of the Acoz Forges Company have realised about par; the annual meeting of the shareholders has been called for Aug. 3. The Kessales Colliery Company has announced an interim dividend for 1875 at the rate of 1*l.* 12*s.* per share,

THE GOLD FIELDS OF YESSO—NEW MODE OF GOLD-WASHING.—No. I.

The results of a systematic geological examination and survey of the more important gold fields of the Island of Yesso are of general interest, and as we have been favoured by the officers of the Kaitakushi with the very valuable report of Prof. HENRY S. MUNROE, E.M., of the Imperial College, Tokio,* we are enabled to give not only the results of the gold-washing, but of the topographical surveys, with an outline of the geology of each field, and some observations on the so-called copper, lead, and silver mines. The fields reported upon are the Toshibetsu, the Kudo, the Esashi, the Matsumai, the Musa, and the Tokachi, and an abstract of the report upon each of these will be in turn given.

The Toshibetsu gold field, situated on the head waters of the river of the same name, is in the province of Iburi, and is most easily reached from the east coast, through the valley of the Kunnui river, from the head of which there is a bridle path across the hills. The Toshibetsu in this part of the valley flows between high hills, about 1000 or 1200 ft. above the sea, or 800 or 900 ft. above the river. The bottom of the valley lies in three, or in some places four, distinct terraces, at about 13, 40, 85, and 260 ft. above the river. The terraces are remarkably uniform, falling in level with the fall of the river, and keeping always about the same relative height to each other and to the bed of the stream. The terraces have a covering (thicker on the higher terraces) of sand and clay upon the gravel, which forms the terrace, and overlies the bed-rock. The auriferous gravels, with their overlying beds of sand and clay, have been deposited in running water. Below the alluvial or terrace formations are volcanic rocks, in large veins or massive eruptions, penetrating the stratified rocks in several places. The stratified rocks, which are very recent, are about 3000 ft. thick, and were at first placed in one group, the Toshibets; but it is better to consider the newer alone, clay rocks and tufas, as belonging to the Toshibetsu group, while the less recent underlying shales and sandstones may be styled the Chingkombe group; the former, reaching a thickness of over 2000 ft., are made up of beds of clay rock, pumice tufa, soft sandstones, and conglomerates; the latter, over 1000 ft. thick, is composed of beds of harder shales and sandstones. The material of the rocks of both groups is almost exclusively volcanic. Granitic rocks occur in a high hill, Tapkop, on the east side of the valley, underlying the stratified clay rocks and shales.

To test practically the richness of the gold-bearing gravel large measured quantities were carefully washed by the Japanese method, and the resulting gold weighed on a delicate assay balance. The cradle said to be used by Chinamen in California in re-working the old dump heaps and tailings was tried by Mr. Blake on Ponkuroiwa when he visited the Toshibetsu, but the results were not very satisfactory, and Prof. Munroe was informed that a larger percentage of gold was obtained by the Japanese from the same place and at the same time. Prof. Munroe also tried the Japanese method in competition with the long tom. The gravel was very poor, and the gold fine. The results show a surprising difference in favour of the Japanese method. In one case, washing with a limited supply of water, one cubic metre of gravel yielded by the native method 30·8 m m. of gold, while the long tom saved but 2·6 m m., or about 1-12th part. In a more favourable locality, washing 3 cubic metres, in each case the Japanese method yielded at the rate of 68 m m. per cubic metre, while the long tom gave but 18 m m. The Professor gives a very interesting account of a modification the Japanese used. But few tools are required—a tsuru, or pick, for occasionally loosening the gravel; two or three special shaped kua, or holes, for working the gravel in the stream or washing ditch; a joren, or scoop-shaped bamboo basket, for removing the coarse gravel; two or three nekoza, or straw mats, specially made for collecting the gold, or an ita, or board, slightly warped and dish-shaped, used as a pan for separating the gold from the concentrated sand. To these were added a masu, or measuring-box, made to hold exactly one-half cubic metre, and provided with a floor of boards to ensure accuracy of measuring. To test the gravel of any desired locality a place was selected on a small stream, when possible, where there was a good exposure of bed-rock a little above the level of the stream, the whole thickness of the gravel bed accessible, a velocity of 2 ft. per second either in the stream itself or in a washing ditch constructed beside it, and sufficient water for washing—60 or 80 cubic feet per minute is the most convenient amount, but much less can be used.

A suitable place found, the bank is cleared of grass, roots, and soil for a width of about 3 ft., and from the bed-rock to the top of the bank, exposing the whole thickness of the gravel bed. The measuring box is then placed in position and filled with gravel only, boulders of exceptional size being omitted. In the meantime the gold washers form a washing ditch by cleaning the bed of the stream for a width of 2 or 3 ft., and a length of 15 or 20 ft. When the stream is large it is divided, only the amount of water requisite for washing being admitted to the ditch. In thus dividing the stream care must be taken that the stones of the dividing wall are so placed that all leakage of water is from the main stream into the ditch, and that there is no flow outwards, otherwise much of the measured gravel with its gold will be lost. These preparations completed the gravel is shovelled from the measuring box into the head of the washing ditch, and the box re-filled with gravel. At the same time the gold washers wash and throw out the large stones by hand, and separate the smaller stones from the gravel with the joren and kua. The rapid current washes out all the clay and fine sand, leaving only the fine gravel in the stream. Riffles built of flat stones are put across the lower end of the ditch to arrest the gravel, and to prevent any gold from being carried down stream. When four or six boxes of gravel have been shovelled into the water, forming a bed of fine gravel about 1 ft. thick, the washing on mats begins. Two or three mats, each 1 ft. wide by 2 ft. long, slightly narrower at the lower ends, are placed side by side across the stream, about 2 ft. below the upper end of the gravel. The upper edges of these mats are buried slightly in the gravel, and held in position by the foot of the gold washer, usually one man to each mat, the number of mats being regulated by the width of the stream.

These men now carefully hoe the gravel to the head of the mats, so that it shall be carried over their surface by the force of the current. The heavy gold and iron-sand sink between the thick twisted strands of straw forming the mat, while the lighter gravel passes down stream. The lower ends of the mats are from time to time lifted, and folded over the upper portion, to transfer the gold to the head of the mat, and to keep the lower part clean. When all the gravel in front of the mats has been hoed over their surface the men move them about 2 ft. down stream, and begin to work in a similar manner on a new portion of gravel thus exposed. Finally, after 25 or 30 minutes' work the mats are removed one by one from the bottom of the stream-folded in both directions under water to transfer the material to the middle, and then bent in a trough-like form, and jigged with a longitudinal motion under the water to separate the lighter sand and gravel which still remain. One of the mats is then held in the stream between the ankles of the gold-washer, folded lengthwise as a trough, through which the water is allowed to flow quietly. A second mat is then seized by the ends and folded transversely, the fold being allowed to dip just below the water in the trough of the mat below. The mats are so woven that this folding opens the crevices between the large transverse strands, allowing the gold and iron-sand to be washed out by the water. By alternately raising each end of the mat while depressing the other the whole surface is successively washed by the stream, and the various strands of the mat being opened and loosened by the folding the gold and iron-sand are very completely transferred to the lower mat. In a similar way the concentrated material from all the mats is collected on one, and from this is finally transferred to the shallow wooden washing board. This last transfer is made with great care in a quiet pool of water, in which place the final concentration on the board is effected.

The separation of the gold from the iron-sand on this board requires great care and skill. The board is first floated on the water, and by a few oscillatory motions the material is washed to the centre. Then it is raised from the water with a number of smart longitudinal jerks, the effect of which is to bring the heavy material to the end next the gold-washer, while the lighter sand flows off gradually with the water at the lower end. The board is now brought to the surface of the water, the lower end dipping a little below, and with one or two gentle swings it is again covered with water, while a small quantity of light sand is washed from the lower end. The board is now raised with the same dexterous shakes as before, the washing being conducted with great care, and but little iron-sand being allowed to pass off each time. After five or six minutes most of the gold will have been brought to the head of the board, the bright yellow grains showing very distinctly in the black sand. The gold may be brought more clearly into view by allowing a little water to trickle down the inclined board, which washes off the black sand, and leaves the gold exposed. The first portion of gold, with some of the adjoining iron-sand, being removed, the remaining sand is washed a few times, usually yielding one or two grains in addition. Finally, the gold and the small quantity of iron-sand taken from the board at the same time, having been dried, are submitted to a careful separation by blowing; the iron-sand is carried off, and the gold remains ready for weighing. In this last separation a small magnet is sometimes of assistance in removing large grains of iron-sand too heavy to be blown away.

* "Geological Survey of Hokkaido. The Gold Fields of Yesso." A report by HENRY S. MUNROE, E.M., Professor of Geology and Mining in the Imperial College, Tokio, and formerly Assistant Geologist and Mining Engineer to the Kaitakushi of Hokkaido. Tokio: The Kaitakushi.

NEW METHOD OF TREATING MIXED COPPER, SILVER, AND GOLD ORES.

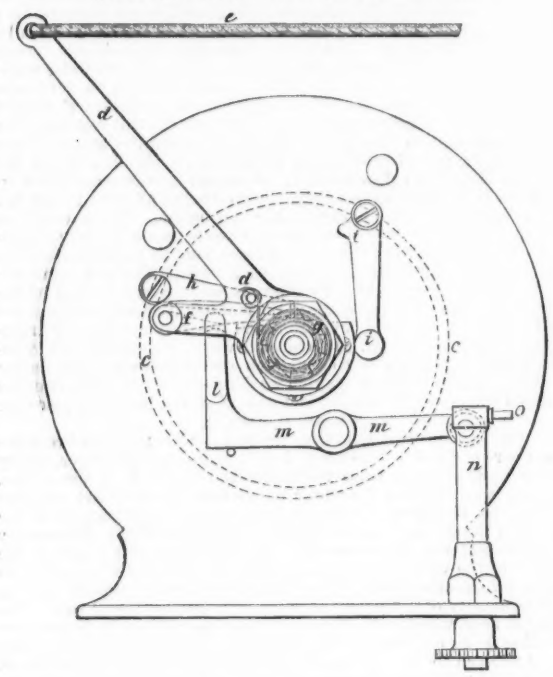
An extension of the Hunt and Douglas copper process so as to make it applicable to the production of gold and silver was recently patented by Messrs. Douglas, Hunt, and Stewart, and the success which has attended its practical application has been very satisfactory. That the presence of copper in solution as chloride assists the extraction of silver from its ores is a fact which is well known and taken advantage of; but the peculiarity of the new process consists in using with the salt a solution of neutral protochloride of iron instead of copper pyrites or bluestone. Both chloride and dichloride of copper convert the sulphuret of silver into chloride of silver, but their use as reagents in the extraction of silver has hitherto been limited by their cost; if, however, these chlorides of copper can be obtained from the copper ores which are often mixed with the ores of silver an important reagent is obtained without cost, while the copper is saved and becomes a valuable bye product instead of being objectionable. To secure these advantages, Messrs. Douglas, Hunt, and Stewart treat silver ores containing copper with a bath of protochloride of iron, which reacts with oxide of copper, giving rise to chloride and dichloride of copper, the latter of which, like chloride of silver, though unsoluble in water, is soluble in brine. The essential features of the new process are the choice of suitable ore, and the grinding, calcining, and chloridising of it; the treatment of the oxydised or chloridised ore with a solution of protochloride of iron and salt in order to dissolve out the copper and most of the silver, and the precipitation in the metallic state of the copper and the silver thus dissolved; the lixiviation of the sands thus deprived of their copper and of part of their silver, with hyposulphite of lime to extract the remaining silver, and the precipitation of the silver thus dissolved by sulphide of calcium; and, if gold be present, leaching the sands exhausted of copper and silver with chlorinated brine and the precipitation of the dissolved gold from this by sulphuretted hydrogen or sulphide of calcium.

In this method of extracting silver the only reagent consumed is the protochloride of iron. The advantages of the system are numerous. In chlorinating in the furnace silver ores containing base metals, such as zinc and lead, a more perfect chlorination is effected by mixing them with ores holding copper and iron, and subsequent treatment with the bath of protochloride of iron. All the copper is recovered at a slight cost. As much copper is extracted from unroasted copper ore or regulus as is contained in the state of protochloride in the solution from the roasted ore, and that unroasted silver-bearing ores or regulus may be decomposed by this solution containing chlorides of copper. The metallic silver is obtained perfectly free from base metals by the precipitation with copper, the silver left undissolved in the residues yielding a much purer amalgam than if the roasted ore had not been previously treated with the bath. Gold if present in the ore is left in the best condition, either to be chlorinated or to be amalgamated with the chloride of silver remaining in the residues. By the removal of the base metals before amalgamation a saving of mercury is effected. A great saving of salt is effected through the recovery by evaporation of the

chlorides usually thrown away in the waste liquors. In treating simple ores of silver, or ores of silver containing but little base metal, as lead or zinc, the costly operation of roasting with salt may be dispensed with, and the inexpensive protochloride of iron may be used to produce the chloride of copper necessary for their treatment.

With regard to the importance of the recovery of salt in the ordinary method of chlorodising silver ores, it will suffice to mention that in Stewart's silver mine in Colorado it was found that 26,258 gallons of liquors were run off daily from the settlers, which had a specific gravity of 12° Beaumé, and contained per gallon 6072 grs. of soluble chlorides. There were thus lost 2263 lbs. of chlorides, chiefly chlorides of sodium and zinc (which was found as suitable a chloridiser as pure salt), whose recovery would reduce the consumption of salt more than one-half. It appears that at Ore Knob Copper Mine, N.C., they obtain by the Hunt and Douglas process from a copper pyrites dressed up to 5½ produce 2100 lbs. of copper for $77, or at the rate of 3⅔ cents per lb. To permit of an estimate being formed as to the practicability of making the process remunerative elsewhere, it may be stated that the prices paid were for 7 cords of wood, $7; to 21 men, at seven furnaces, at $1 = $21; to four men charging furnaces and tanks, and four emptying tanks and removing residues, at 75 cents = $6; to two men attending tanks, $2; foreman, $2; chemist, $3; for 525 lbs. of salt, $6·56; and for 1470 lbs. of iron at 2c. = $29·40; making $76·96 in all. The cost of the plant required for the process is small. The furnaces are simple and inexpensive in construction, and require about 25,000 bricks each. The tanks cost complete about $60 each, and the labour employed need not be skilled nor high-priced, as the ordinary labourers of the country can in a short time be trained to the routine of the work. Both the copper and the mixed ore processes appear well worthy of a trial in this country, and there can be little question that in the hands of competent men it could be made very remunerative.

SIGNAL APPARATUS FOR COLLIERIES.



The importance of reliable and readily intelligible signals for collieries has been so long recognised that a large number of inventors have given their attention to the question of producing an apparatus at once cheap, efficient, and not liable to get out of order; and the ideas as to the best means of securing these advantages have been very various. By far the greater number of practical men, however, are in favour of the bell, owing to the sound produced being so entirely dissimilar to any other, which is not the case with the whistle and some other instruments that have been suggested, that there is no liability to accident arising from confusion or misapprehension. The patent signal bell recently introduced by Mr. W. Leech, of the Pepper Mill Brass Foundry, Wigan, appears to have given thorough satisfaction, so that a brief outline of the invention will be generally interesting. The object of the invention, which is equally applicable to collieries, mines, and all other underground works, is to combine visible and audible signals from the persons at the bottom of the shaft to the engineer at the pit mouth, such signal remaining visible until the engine has commenced to wind up, and then returning automatically to zero. The audible signal is produced by means of a bell provided with a hammer connected by a lever to a cord or wire, which extends to the bottom of the pit or shaft, and the audible signals are given by one or more strokes (or as they are called "knocks") on this bell. The visible signal is given by means of a pointer and dial placed in front of the bell, and connected with the lever above named by a ratchet wheel and pawl (or otherwise) in such a manner that each time the wire is pulled the pointer is moved one division on the dial, so that the pointer indicates the number of "knocks" given on the bell. The pointer remains at the particular division corresponding with the number of "knocks" given until the engine commences to wind up, when a finger raised by a cam or eccentric in direct connection by worm or other gearing with the engine lifts the pawl out of the ratchet wheel, and a coiled spring on the axis of the pointer brings the latter back to the "zero" point, ready to indicate another signal.

The details of the apparatus by which the signals are made will be readily understood. An ordinary dial with nine divisions numbered against the sun from 0 to 8 forms the front of the apparatus, the back view of which, the bell being removed, is shown in the above diagram, the index finger being, of course, carried upon the central barrel like the hour-hand of a watch; *a* and *b* represent the dial and pointer respectively, both of which it is unnecessary to show; *c*, *c* is the bell. The pointer is moved by means of a lever *d*, *d*, to the upper end of which is attached a cord *e*, *e*, which passes over pulleys or otherwise to the bottom of the shaft. The lever *d*, *d*, carries a pawl *f*, *f*, which acts upon a ratchet wheel *g*, *g*, having nine teeth, and fixed upon the axis of the pointer *b*, *b*. Thus each time that the cord is pulled the pointer is moved one division of the dial, a retaining pawl, *h*, keeping it in its place until released, when a coiled spring *j*, *j*, brings the pointer back to zero. To prevent the pointer from moving beyond the figure 8 the ninth tooth is partly cut away, so that the pawl does not act upon it. The apparatus may, of course be constructed so as to give any other number of signals more or less than eight. Each time that the lever *d*, *d*, is pulled over it comes against a projection on the hammer *i*, *i*, and causes it to strike the bell, and thus the number of times that the cord has been pulled is indicated both by the position of the pointer and the number of strokes sounded upon the bell.

Beneath the pawls *f* and *h* is a finger *l*, *l*, which is placed in direct connection with the engine in such a way that as soon as the engine commences to wind up it causes this finger to raise the pawls *f* and *h* out of the teeth of the ratchet-wheel *g*, *g*, when the coiled spring *j* on the axis of the pointer immediately returns the latter back to zero ready for another signal. This may be done in a variety of ways, but in the arrangement shown in the drawing the finger *l*, *l*, is attached to, or forms part of, a level *m*, *m*, the other end of which carries a bowl, which at each revolution of the upright spindle *n*, *n*, is depressed by a pin or projection *o*, *o*. At the lower end of the spindle *n*, *n*, is a toothed wheel, which is driven by the worm, or other gearing, from the engine. It will at once be seen that as soon as the engine commences to wind up the pin, *o*, *o*, depresses one end of the lever *m*, *m*, and causes the finger *l*, *l*, at its other end to raise both of the pawls *f* and *h*, and allows the coiled spring to return the pointer back to zero.

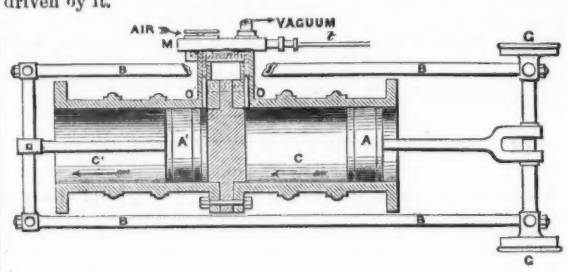
The advantage of Mr. Leech's arrangement is obvious; the momentary inattention of the engineer at the pit mouth cannot be disastrous, as is possible with existing arrangements, since should he have the slightest doubt as to the signal which had been given the dial will instantly set him right. None of the parts of the apparatus being new any ordinary workman will be able to attend to them, whilst the combination forms a really new and valuable invention, worthy of extensive adoption.

NEW DOUBLE-ACTING ATMOSPHERIC ENGINE.

The inventor of this engine is Mr. PAUL NOLET, jun., of St. Aignan-sur-Cher, France, a student of Engineering at University College, London. He was long ago struck with the difficulty which besets small manufacturers in obtaining motive power for their lathes and looms at places which are otherwise eligible for carrying on their trades. Unless their work is extensive enough to enable them to keep a steam-engine going for their own especial behoof, they are almost inevitably obliged either to take workrooms in the near neighbourhood of some larger manufacturer from whom they can rent the power they want, or to put up with clumsy and inconvenient modes of generating it for themselves by manual or pedal labour. The usefulness to such persons of any method of supplying them with motive power at their own homes or workshops—power which they may proportion exactly to their requirements, and regulate at their pleasure—must be apparent to everyone. How to supply power of this nature to such persons was the problem Mr. Nolet set himself to solve, and his solution of it is the "double-acting atmospheric engine" of which the accompanying diagram is a section.

In seeking for a solution of his problem Mr. Nolet seems to have hit upon a principle applicable to innumerable cases other than the specific one he had in view. In fact, his engine turns out to be a means by which motive force, from whatever source obtained, may be transformed into atmospheric force, and so transmitted undiminished and without danger or inconvenience to, practically, any distance.

If, for instance, a waterfall exists several miles away from the most convenient situation for a saw-mill on the hills, or a spinning-mill in the valley, it may, nevertheless, be made available for their use; or the power generated by a single steam-engine may be distributed over an entire quarter of a town—through workshops, on every floor. It seems, too, that the engine may be employed to work the rock-drilling and boring machines used in mining and tunnelling, as conveniently as, and probably more safely than, the hydraulic or compressed air methods now in use. Indeed, there is no reason why domestic machinery of many kinds should not eventually be driven by it.



The machine represented in the diagram consists of two cylinders, C and C', placed end to end and hermetically separated. In these cylinders work two pistons, A and A', connected by a parallelogram of rods, B, B, B, B; at the bottom of each cylinder is an opening, O and O', by means of which they are brought into alternate communication with an exhauster and with the atmosphere. The pistons being in the position shown in the drawing, *i.e.*, A at the top, and A' at the bottom of its stroke, O' (the opening in C') is placed in communication with the atmosphere, and O (the opening in C) in communication with an exhauster; the air in the cylinder C is removed, and the atmospheric pressure on the surface of the piston A causes it to descend, whilst the admission of air into the cylinder C', through O', allows A' to ascend without any obstacle. When A has reached the bottom of its stroke the communication is reversed (by the method presently described), O' is placed in communication with the vacuum, O with the atmosphere; and the same operation is repeated, but in the opposite direction—A' descends to its former position, whilst A again ascends. An alternate horizontal motion is thus produced which may, of course, be changed into circular motion by any of the ordinary mechanical methods.

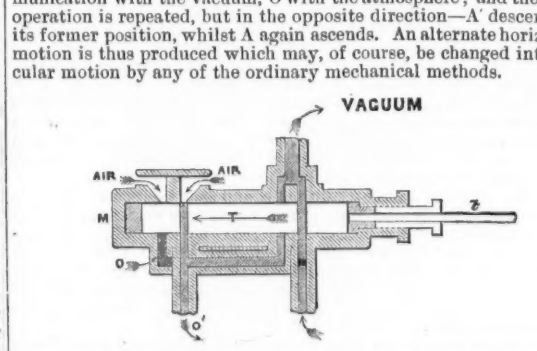


Fig. 2 shows how the alternate communication of the cylinders with the exhauster and with the atmosphere is brought about. O and O' correspond with the O and O' in fig. 1; T is a plug pierced in two places, which works in the chamber M. It is connected with, and worked by, an eccentric attached to the fly-wheel. In the position shown in the drawing (which corresponds to that of the pistons in fig. 1) the right hand aperture in the plug is continuous with the opening O in the cylinder C, and places it in communication with the vacuum pipe; at the same time the left hand aperture in the plug is continuous with O' and places C' in communication with the atmosphere. At the moment the pistons are at the end of their stroke (*i.e.*, when A reaches the bottom of the cylinder C) the eccentric drives the plug T to the end of the chamber M. The right hand aperture in the plug is then continuous with the bent tube connected with O' and brings C' in its turn into communication with the vacuum, whilst the left hand aperture becomes continuous with the bent tube connected with O, and places C in communication with the atmosphere. This movement, too, is reversed with the opposite stroke of the pistons, and so the alternate horizontal motion is kept up.

Of course the mere connection of the vacuum pipe with an exhauster offers no difficulty. It may be by means of a pipe laid like an ordinary gas pipe, and its length is practically immaterial to the working of the machine. That such pipes can be laid down and a vacuum produced in them over considerable distances the successful working of the pneumatic dispatch has abundantly demonstrated.

The whole of the details of the arrangements for distributing the power will very much resemble those now in use for distributing gas and water. A large air-pump worked by the available water or steam power, mains radiating through the streets, service pipes to the various floors of houses and manufactories, and separate stop-cocks which will enable each operative to connect and disconnect his lathe or loom or other machine at pleasure. The simplicity of the idea certainly appears to be on a par with its possible usefulness, and this is, after all, the measure we must apply in judging of any invention. Anyhow, it seems to mark Mr. Nolet as possessing the *esprit mechanique* in a considerable degree, and gives reason to hope much for his future usefulness if he devotes his attention to solving problems of this nature, and bringing within the reach of the many small independent workmen the advantages of appliances which at present, from their costliness, can only be enjoyed by large manufacturers and their employees.

MAY AN ILLEGAL ASSOCIATION BE WOUND-UP?—Vice-Chancellor Malins has had before him, in the case of the South Wales Atlantic Steamship Company, a petition to wind up compulsorily, as an unregistered company, under section 199 of the Companies Act, 1862, an association which was admittedly illegal in its original constitution. The petitioners were the solicitors to the Association from its inception in 1871 down to its metamorphosis into a limited company in May, 1874. The number of persons who signed the original agreement was 74, and the number of shares they represented was 191. Among them were the Marquis of Bute, Sir W. Armstrong, and Mr. Alexander Brogden. The adventure was not profitable, and in May, 1874, an attempt to obtain further capital by turning the Association into a limited company was made, but this not succeeding, it was sought to raise 85,000*l.* by debentures, to be taken up by the original members. Only 42,000*l.* was raised in this way, while the debts were found to amount to 98,000*l.* In May last, at a meeting of shareholders, a resolution was passed to wind-up voluntarily. When it was ascertained that the only assets in the hands of the liquidators were 13,000*l.* and two steamships, which were subject to a debenture mortgage, it was deemed advisable to apply to the Court of Chancery for an order to wind-up the association compulsorily as an unregistered company. The Vice-Chancellor was of opinion that this was meant to be an unlimited company, however extraordinary it might appear that a body of influential noblemen and gentlemen should have failed to avail themselves of the Limited Liability Acts. This being an illegal association, because not registered, although consisting of more than 20 members, it was admitted that an application by one of its members to wind it up could not succeed. Then, was a creditor who had notice of its illegal constitution, or who ought to have known it, in any better position? The present petitioners, the solicitors to Lord Bute, were parties to the formation of the association, and ought to have advised the members that their constitution was illegal. They could not be allowed now to avail themselves of the machinery of the very Act the provisions of which they chose to disregard. The petition, therefore, would be dismissed, with costs.

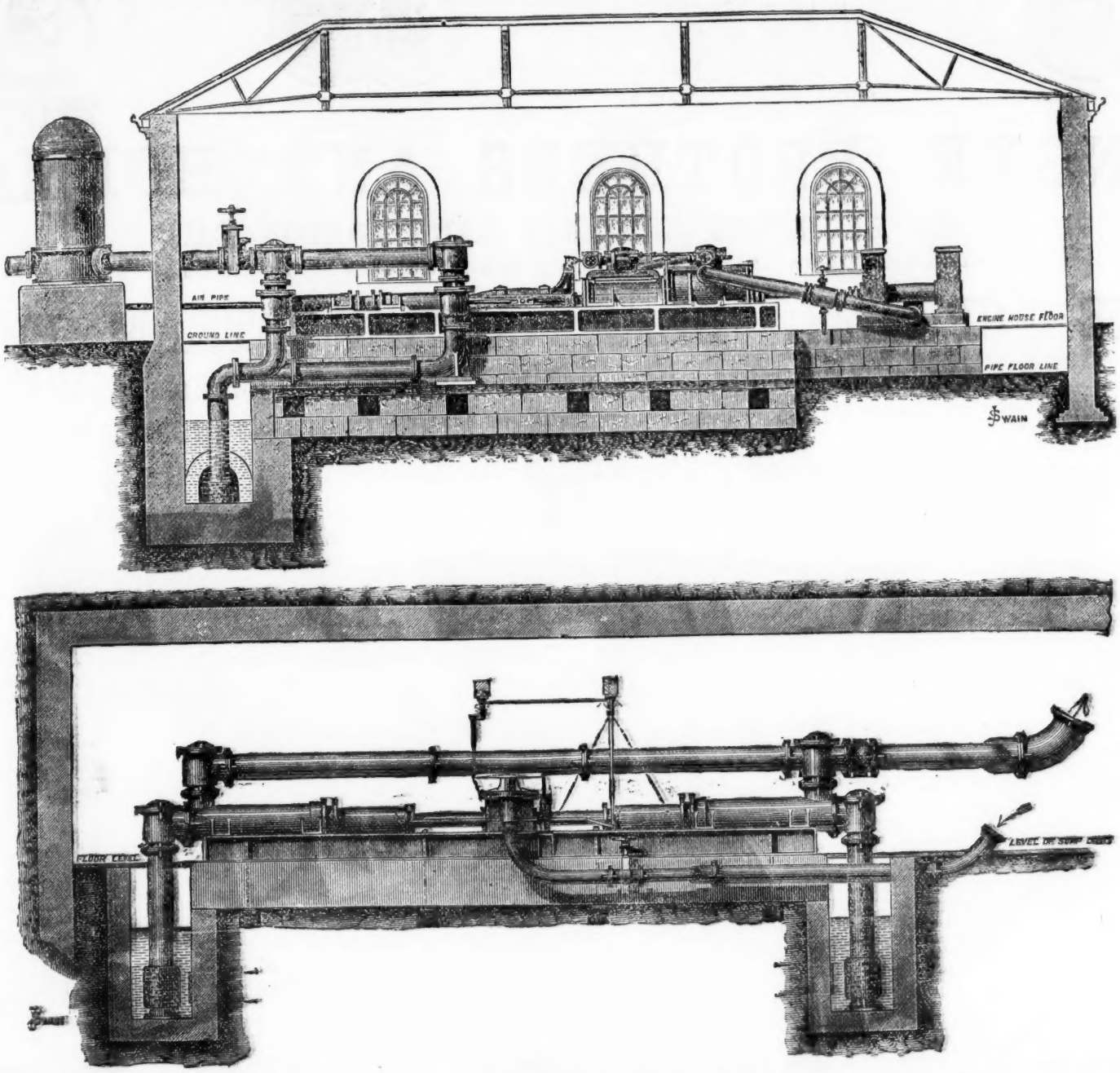
EDUCATIONAL GEOLOGY.—More than half a century ago Mr. Thomas Sopwith, M.A., F.R.S., added largely to the interest in the then infant science of geology by constructing a number of small models representing geological phenomena. He states that he was often surprised by unexpected results obtained in this way, not only as regards the arrangements of stratified rocks, but as showing the explanations of difficult problems which were best demonstrated by means of movable models. The costliness of the models prohibited their extensive use, and to remove this objection Mr. Sopwith has prepared a series of six, which can be produced comparatively cheaply. He explains that in thus reducing the number of models from twelve to six he has kept in view that minuteness of detail is not so much required as it was 30 years ago. Thus, for example, the second of the original series which exhibited the succession of seams in the North of England coal district is superseded by information in greater detail in recent geological and mining works, which in rich abundance have been published since then, and especially so in the valuable publications of the North of England Institute of Mining Engineers. An additional separation in one of the new models makes its explanatory of two of the old series, and without diminishing the instructive parts of the design the omission of some subdivisions of strata gives greater prominence to the principal points to be elucidated. In these alterations he has gladly availed himself of the advice of some eminent geologists of the present time, including Sir Charles Lyell, to whom the models and the description of them were to have been dedicated, and who was justly esteemed as being at the very head of geological science. The new series embraces models showing—stratified rocks and valley of denudation, dislocation of strata in carboniferous rocks, surface indications of coal, overcutting of strata, undercutting of strata, and intersection of mineral veins. Under the title of "Description of a series of Elementary Geological Models illustrating the Nature of Stratification, Valleys of Denudation, the Effects produced by Faults or Dislocations, Intersection of Mineral Veins, &c. With notes on the Construction of large geological models. By T. Sopwith, M.A., F.R.S., F.G.S., &c. (London: Mitchell and Sons, Parliament-street; James Tennant, Strand), a new edition of Mr. Sopwith's well-known pamphlet adapted to the new series of models has been published, and is so arranged that it may be studied either with or without the models themselves although a constant reference to them is of course a very material assistance to the comprehension of the subject. These models should certainly be in every technical school where subjects connected with mining are taught, and students may well be congratulated upon so ready a means of acquiring sound practical knowledge being placed within their reach.

UTILISING WASTE HEAT.—In the annual report of the Association of Engineers educated at the Liége School, the Belleville boiler is recommended as excellent. The most important point is to make the furnace and boiler independent of each other. The chimney must have a height of 15 to 20 metres, and a diameter equal to the flue. The hot channels, which lead the flames to the boiler, have the same cross section as the chimney, and the number of elements of the boiler should be such that the sum of the transverse sections between the tubes of a horizontal series is equal to the cross section of the flue or chimney. Experience enables us to assume that for 4000 to 5000 kilos (4 to 5 tons) of coal consumed in 24 hours, with a furnace running continuously, a boiler of 50 nominal horse-power is sufficient to reduce the temperature of the gases, which have passed it, to a point below the melting point of lead. The effective action will equal one-half or one-fourth of the nominal power of the boiler. The feed-pump must be of such dimensions that the boiler is fed continuously; the cross section of the pump-piston must be three or four times larger than that of the plunger-piston. The tubes should be cleaned, and this is easily done, every three to six weeks, according to the quality of the water employed. In the heat pipes, as well as at the lower end of the chimney, openings are left for removing the ashes that are carried along. The exterior of the boiler must be frequently cleaned, so that the draft of the furnace be not injured by the soot collected on the tubes. It is recommended to insert between the boiler and the furnace a canal of refractory masonry, with thick walls, and 4 to 6 metres long, since in this case the resulting loss of heat would be only trifling, and the damper, which would be inserted close to the boiler, would not be so easily attacked. This damper should best be made of strong iron plates, 12 to 15 millimetres thick. It is also an advantage to keep the boiler continually in use, in order to avoid loss of heat due to frequent interruptions. If the distance between the furnace and the engine to be run is great this should not be considered an obstacle, since steam can be led 100 to 150 metres without injury if the steam-pipes are well isolated, elastic compensating pieces inserted at definite distances, and the steam be passed through an apparatus for collecting the condensation water before it enters the engine.

MINING MACHINERY IN CALIFORNIA.—The hoisting works for the California and Consolidated Virginia Mines, now in course of manufacture at the Pacific Ironworks, is probably the most massive mining machinery ever made. It is to be used on the joint shaft of the two great mines. These hoisting works are being made on the same principle as those at the Mount Diablo Coal Mines. The hoisting is done from the engine-shaft, there being no spur-wheels. This will be the first one of the kind on the Comstock, and is of a capacity to hoist 4000 ft. There are two engines, 26 in. bore and 6 ft. stroke, fitted with balance poppet valves and cross cut-off. The cylinders are very pondrous, weighing 16,000 lbs. each. The bed plates will weigh between 16,000 and 17,000 lbs. each. There will be one engine on each end of the shaft, the distance between them being 24 ft. from centre to centre. The shaft is 16 in. in diameter in the main journals, and 18 in. where the reels are to be placed. Double reels for flat wire-rope are to be used. The reels commence at 6 feet, and wind up to 14 feet in diameter. The engines are supplied with two steam breaks, one for each reel, and also a hand break for each reel. The steam break is so arranged that the breakman or the engineer can put it on at pleasure, and and if the cage should rise higher than it ought to a connection is automatically made, so that the steam is at once shut off from the main engines and the steam-brake applies itself, thus making accident impossible. There are six tubular boilers, 54 in. in diameter and 16 ft. long. Only four will be used at a time, the other two being reserved for emergencies. Globe valves are used to connect any pair at will. The clutches to throw the engines into gear weigh 4500 lbs. each, and have wrought-iron bands shrunk around them for additional strength. There are no gear-wheels at all, and the two fly wheels act as brake wheels. Everything will be fitted up in the shop before being shipped. The excavations for the reception of this massive machinery at the mine are nearly completed, and the anchor bolts and plates are being placed in position ready to commence the mason work. It is stated that a duplicate of this machinery has been contracted for by the Lady Washington Mining Company on the Comstock.—*San Francisco Stock Exchange.*

IMPROVED STONE BREAKER.—According to the invention of Messrs. BRADLEY and MADDERSON, of Great Ayrton, a horizontal rocking lever is combined with two toggles, two moveable and two fixed jaws. The lever is mounted on a cross shaft between the side frames of the machine, the cross shaft passing the centre of one end of the lever. To the other end of the lever one end of a short connecting rod is attached, the centre upon which it works being placed in an eccentric hole in the rocking lever, the other end of the connecting rod being connected by an eccentric or other suitable means to the main shaft. At the top and bottom of the face of the rocking lever an aperture is bored out for the reception of the toggle seat. The two sets of jaws are placed one above the other, in front of the lever, each of the moveable jaws being provided at their rear with a toggle seat corresponding to those formed in the lever, and connected to the latter by means of a toggle, the toggle connecting the upper moveable jaw with the upper portion of the lever being of greater length than that connected with the lower pair of jaws. When motion is given to the main shaft of the machine the horizontal level is caused to rock or vibrate, thus alternately actuating the upper and lower movable jaws, the material under treatment passing from the upper pair of jaws to the lower.

THE DIFFERENTIAL EXPANSIVE PUMPING ENGINE.



THE DIFFERENTIAL EXPANSIVE PUMPING ENGINE.

The chief peculiarity in the invention of Mr. HENRY DAVEY (of Messrs. Hathorn, Davis, Campbell, and Davey), of Leeds, is, as has already been explained in the Journal, the simple manner in which the engine is made perfectly safe in working under all conditions of load, automatically and instantly varying its supply of steam with very minute increase or decrease of resistance; the distribution of steam being such that the pumping is performed without shock, even when the pressures suddenly and greatly vary. In designing pumping machinery, as also in designing steam machinery of all kinds, the three great questions which should be thoroughly and relatively considered are—economy of fuel, economy of maintenance, and economy of construction. The importance of economy in fuel was never more keenly realised than at the present time, notwithstanding the great advances which have been made to reduce the consumption. Our steam-engines consume annually 37,000,000 tons of coal, which at the present moment may, perhaps, be reckoned at 15s. per ton, representing over 27,000,000*l.* sterling; an economy of 25 per cent. would, therefore, effect a saving of nearly 7,000,000*l.* annually. With colliery pumping-engines it is not unusual to find a consumption of from 12 lbs. to 14 lbs. of coal per horse-power per hour. A good compound engine will work with less than one-fourth that amount of fuel.

The Cornish engine, as Mr. Davey explains, is a very costly machine; it is only single acting, and it requires a great moving mass to make it practicable to employ a high degree of expansion; nor can it be made double-acting without making it necessary to increase the mass beyond a practical limit, or to employ a low ratio of expansion involving a great waste of fuel. To meet these difficulties Mr. Davey designed the compound differential expansive engine, in which expansion may be carried to a great extent with a piston speed not too great for actuating pumps during both strokes, nor requiring a heavy moving mass, making it practicable to secure economy of fuel with a comparatively small outlay of capital, and greatly reduced expenditure in maintenance. In the differential engine the main slide or other valves receive their motions from a lever to the centre of which they are connected. This lever receives two motions, one derived from the main moving parts of the engine by another lever of the first order, which, receiving the full motion of the piston at the long end, imparts from its short limb the amount of motion suitable to the working of the valve, and another motion derived from a subsidiary piston. This subsidiary piston receives its motion from the steam in the main slide chest by means of a small valve, and gives motion to a cataract piston working in a cylinder filled with water which escapes from side to side through small openings that can be regulated at pleasure. This cataract regulates the speed of the subsidiary piston, and consequently the motion of the end of the lever to which it is attached.

The Differential Hydraulic Pumping Engine, illustrated above, has many applications. It is employed in pumping from the bottom to a point some distance up the pit, where the main pumping-engines are situated, or it may be worked from a natural head of water, or from an accumulator. The principle of its action is that of employing water at a given head to raise a larger quantity against a less head. In hilly mining districts water may be accumulated at a high elevation, and conducted to the mine in pipes, there employed in one of those engines to pump the water from the mine. In this way the cost of steam-power may often be saved. These engines are also suitable for accumulating power and transmitting it from one point to another far distant. For example, water flowing from an elevation on one side of a valley may be made to pump water to a higher elevation either on the same or on the opposite side, and there stored for use, or employed in giving motion to machinery, or for any other purposes. The upper illustration represents the compound differential engine as applied for town water supply, while the lower engraving represents one of a pair of engines made to raise 1000 gallons per minute 300 ft. high. In this engine there is no piston, neither is there any internal packing or slide valve to get out of order. The packing is all applied in stuffing-boxes. The valves are gun-metal mitre valves with large areas, producing no throttling, and will work under the heaviest pressures without excessive wear. The engine is under self-control by means of the differential gear.

The list of engines at work or in course of construction affords abundant evidence that the merits of the invention have been largely appreciated. One raises 6000 gallons per hour 1000 ft.; others 78,000 gallons 240 ft.; 90,000 gallons 420 ft.; and two 120,000 gallons 600 ft. Numerous others are lifting from 1200 to 72,000 gallons per hour from 80 to 910 ft., and in every case they seem to have given perfect satisfaction, Mr. Lishman, of the Newbottle Colliery office, writing that he is happy to bear testimony to the satisfactory working of the compound differential engine supplied to Earl Durham's "Herrington Winning" some months ago. He adds that he has "had considerable experience in the working of pumping engines in sinking pits, but never one that he was so satisfied with as the 'differential.' From what he has seen of it he believes that it is equally suitable for forcing or lifting. Everyone who has seen the engine is much pleased with it." And others who have had it in use give equally gratifying accounts of its working.

The invention has already been brought largely into use, and as it becomes more extensively known will, doubtless, be still more generally appreciated.

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PATENT STEAM PUMPS,

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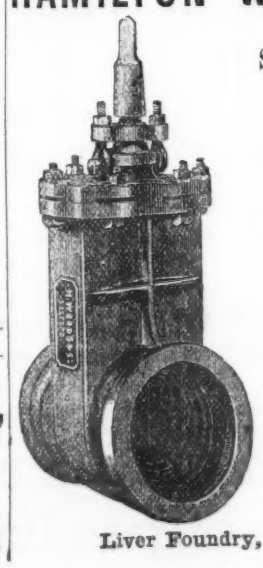

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SOCKET AND FLANGE VALVES,

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Proved up to 200 lbs. per square inch.

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With Gun-Metal Screws, Valves, and Nuts.

BALL HYDRANTS.

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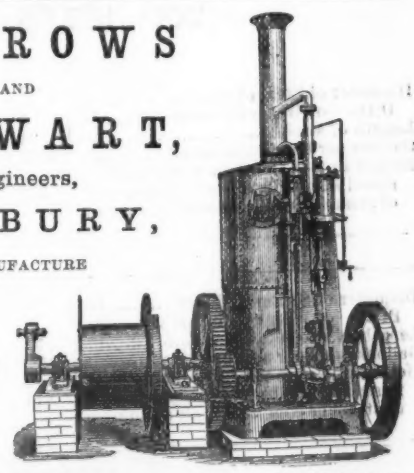

STEAM ENGINES, FOR PIT SINKING WINDING COAL, PUMPING, &c.

Also COMBINED MILLS and ENGINES for Grinding Slag, Sand, Mortar, &c.

Specifications and prices on application.

PARIS EXHIBITION, 1867.

VIENNA EXHIBITION, 1873.

LONDON EXHIBITION, 1874.

CORNWALL POLYTECHNIC SOCIETY, 1867 and 1873.

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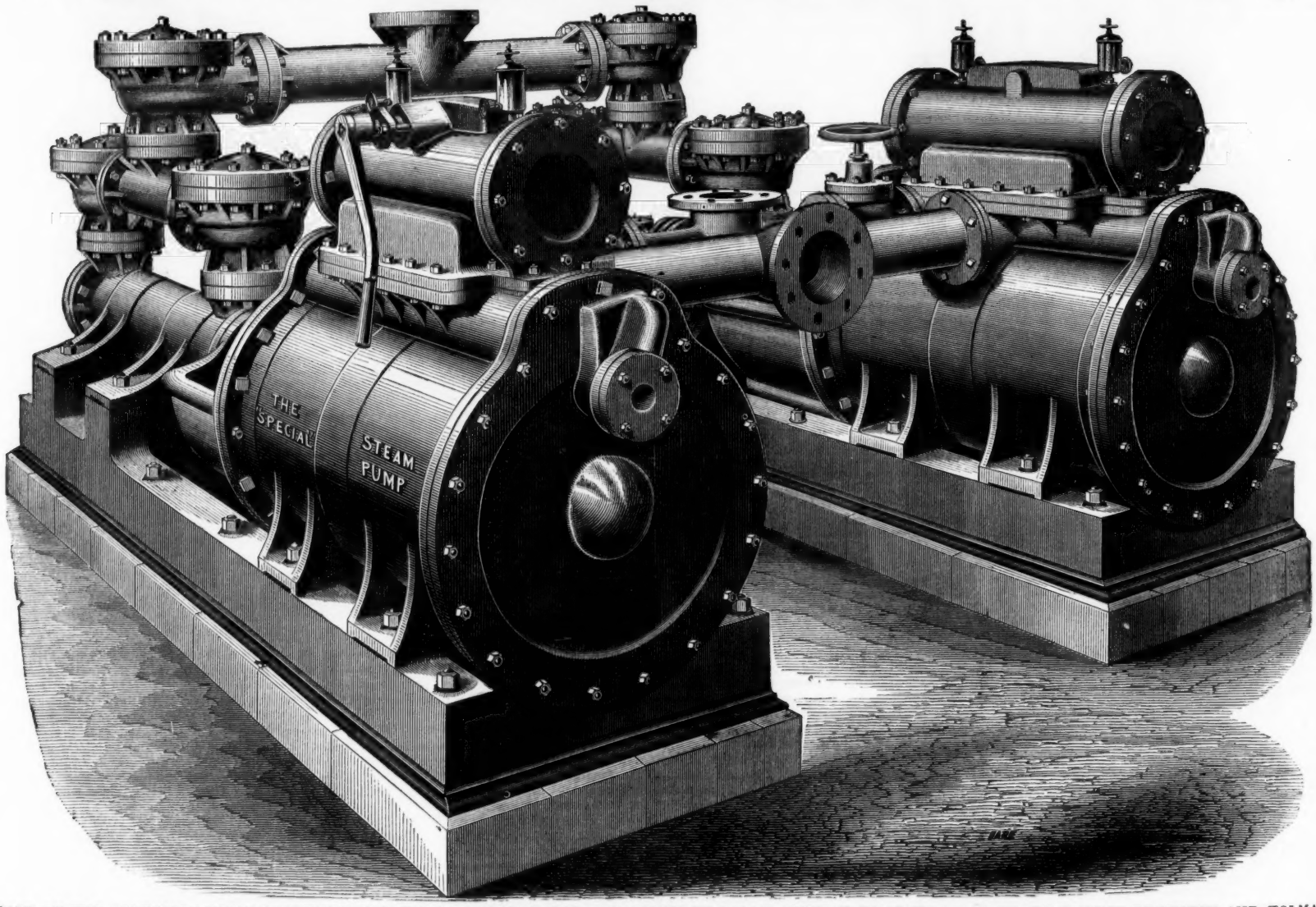
THE "SPECIAL" DIRECT-ACTING STEAM PUMP.

OVER **12,000** IN USE IN **ENGLAND** AND AMERICA.

SUCCESSFULLY ADOPTED IN A LARGE NUMBER OF MINES IN THIS COUNTRY AND ABROAD.



PAIR OF THE "SPECIAL" DIRECT-ACTING STEAM PUMPS SUITABLE FOR HIGH LIFTS IN MINES, SIMILAR TO MANY SUPPLIED BY TANGYE BROTHERS AND HOLMAN.

The following extract from a letter, received by Tangye Brothers and Holman from J. Bigland, Esq., dated Feb. 25, 1875, refers to a "Special" Direct-acting Steam Pumping Engine supplied four years ago to Messrs. Joseph Pease and Partners, for the Adelaide Colliery, Bishop Auckland. The engine is throwing about 8000 gallons per hour, 1040 feet high, in one direct lift:—

"The underground pumping engine at Adelaide Colliery is working night and day. It does its work satisfactorily, and gives us very little trouble. Some of the cup leathers which form the plunger packing have worked three months. The working barrel is in beautiful condition. The average duration of the valve seats is about eight months; they work and keep tight as long as there is a bit of them left. I expect the valves (Holman's patent) and the buffers will last as long as the colliery."

Extract from a letter received by Tangye Brothers and Holman from W. H. Eagland, Esq., dated Feb. 27, 1875, in reference to a "Special" Direct-acting Steam Pumping Engine supplied two years ago to the West Yorkshire Iron and Coal Company near Leeds, to throw 16,000 gallons per hour, 465 feet high, in one direct lift:—

"It is at work night and day. Our man goes down to the pump twice a day (TEN A.M. and FOUR P.M.), to supply the tallow cups. After this it is left every day till he comes next morning, when he goes down again at TEN A.M. as before. The only repairs the pump has had for 12 months are one bucket, which had worked since we got the pump, and one valve seat, but no valve, so it has cost very little. Its first lift is 70 yards perpendicular, then the water passes up pipes for half a mile, ascending another 70 yards, and then another perpendicular pipe of 15 yards —total, 155 yards vertical height."

Extract from the Official Report of the Commission of the German Empire on the Vienna Exhibition of 1873, treating on Pumping Engines:—

"Contrary to these older pumping engines exhibited, there is now nearly everywhere the opinion established that the ('SPECIAL') pumping engines placed underground, which are made on A. S. Cameron's principle by Messrs. Tangye, are preferable to all. They do much duty combined with great compactness. They dispense entirely with the troublesome rod arrangement, giving often rise to stoppages, so that they will be applied shortly to a great extent, and are already in use in many localities. There is no doubt that this in every respect practical system will command a general adaptation."

200 SIZES AND COMBINATIONS OF THESE PUMPS ARE NOW MADE.

The following are a few of the Sizes for High Lifts in Mines:—

Diameter of Steam Cylinder .....In.	7	8	9	9	10	10	12	12	12	14	14	14	16	16	16	16	18	18	18	18	21	21	21
Ditto of Water Cylinder .....In.	3	3	3	4	3	4	3	4	5	4	5	6	4	5	6	7	5	6	7	8	5	6	7
Length of stroke .....In.	24	24	24	24	36	24	36	36	36	36	36	36	36	36	36	36	48	36	36	36	48	48	36
Gallons per hour approximate	1830	1830	1830	3250	1830	3250	1830	3250	5070	3250	5070	7330	3250	5070	7330	9750	5070	7330	9750	13,000	5070	7330	9750
Height in feet to which water can be raised with 40 lbs. pressure per sq. in. of steam or compressed air at pump	325	425	540	300	665	375	960	540	345	735	470	330	960	615	426	312	775	540	400	300	1058	740	540

CONTINUED.

Diameter of Steam Cylinder .....In.	21	21	21	24	24	24	24	24	26	26	26	26	26	30	30	30	30	30	32	32	32	32	32
Ditto of Water Cylinder .....In.	8	9	10	6	7	8	9	10	7	8	9	10	12	8	9	10	12	14	8	9	10	12	14
Length of stroke .....In.	36	36	36	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Gallons per hour approximate	13,000	16,519	20,000	7330	9750	13,000	16,519	20,000	9750	13,000	16,519	20,000	30,000	13,000	16,519	20,000	30,000	40,000	13,000	16,519	20,000	30,000	40,000
Height in feet to which water can be raised with 40 lbs. pressure per sq. in. of steam or compressed air at pump	413	326	264	960	700	540	427	345	827	633	500	405	282	840	665	540	375	275	960	758	625	426	313

PRICES OF ABOVE ON APPLICATION.—FOR SIZES AND PRICES OF PUMPS FOR LOWER LIFTS SEE SEPARATE LIST.

HOLMAN'S PATENT CONDENSER will be found a great acquisition to all kinds of Steam Pumps, as not only is the exhaust steam completely condensed, and the annoyance from same blowing off entirely got rid off, but a vacuum is obtained in the steam cylinder saving from 20 to 50 per cent. in fuel, and increasing to a considerable extent the economy and efficiency of the Pump.

NORTH OF ENGLAND HOUSE ... ... TANGYE BROTHERS AND RAKE, ST. NICHOLAS BUILDINGS, NEWCASTLE-ON-TYNE.
SOUTH WALES HOUSE ... ... TANGYE BROTHERS AND STEEL, Tredegar Place, NEWPORT, Mon.; and Oxford Buildings, SWANSEA.

THE "LEVET" ROCK DRILL.

SUPERIOR TO ALL OTHERS.

COPY OF TESTIMONIAL FROM THE ENGINEER, BLANZY MINES, FRANCE. *Feb.* 25, 1875.

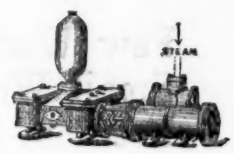
I hereby certify that the new Rock Drill of C. Levet's System has worked at the Blanzy Mines since Nov. 20 without there being the slightest necessity for repair. Its results up to this date have been superior to the other Rock Drills employed in the said mines. (Signed)

THE ENGINEER OF THE MINES, POUMAIREAU.

THE SACCHARUM WORKS, SOUTHAMPTON.
ANGLO-BAVARIAN BREWERY.

GENTLEMEN,—We have much pleasure in stating that the "STANDARD" Steam Pumps supplied to us for these works, and for our Brewery at Shepton Mallet, give us entire satisfaction. The two first we had from you have been in use for 12 months, and they are still in good working order. THEY ARE ENTIRELY FREE FROM THE NOISE IN WORKING WHICH ALL OTHER STEAM PUMPS WE HAVE TRIED ARE SUBJECT TO; they throw a large quantity of liquor fully equal to the amount named in your Circular, and we can confidently recommend them in preference to any other pumps we have used. Yours truly,

(Signed) HILL, GARTON, AND CO.



FOR PARTICULARS OF

ROCK DRILLS, AIR COMPRESSORS, COAL CUTTERS, "STANDARD" PUMPS,

AND ALL OTHER MINING MACHINERY, APPLY TO

CHARLES HARWOOD & CO.,

St. Stephen's Chambers, Telegraph-street, Moorgate-street,

LONDON, E.C.

GEORGE ANGUS AND COMPANY,

ST. JOHN'S LEATHER AND INDIA-RUBBER WORKS,

NEWCASTLE-UPON-TYNE.

Every description of Leather, India-rubber, and Gutta-percha for Engineering and General Mechanical purposes.

The ONLY PRIZE awarded for "FUEL ECONOMISERS" at the Vienna, Paris, and Moscow Exhibitions, was given to

GREEN'S PATENT FUEL ECONOMISER.

AN INDISPENSABLE APPENDAGE TO STEAM BOILERS.

MOSCOW, 1872.

In operation to upwards of 2,550,000 h.p.

VIENNA, 1873.

SAVES 20 to 25 per cent. of Fuel.

PARIS, 1867.

EDWARD GREEN AND SON, Engineers and Sole Makers, 14, St. Ann's-square, Manchester.

ALSO LONDON, GLASGOW, DUSSELDORF, &c.—WORKS: WAKEFIELD.

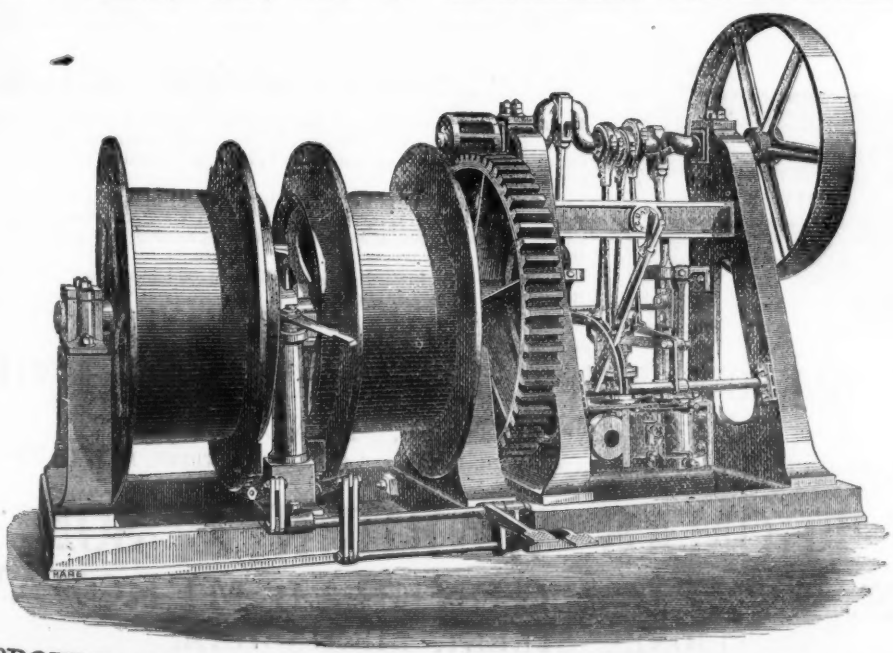
THE BURLEIGH ROCK BORING COMPANY, LIMITED,

100, KING STREET, MANCHESTER. RICHARD MOTTRAM, SECRETARY.

For Sinking Shafts, Cutting Tunnels and Levels, and General Rock Blasting Operations, by contract, and for the Sale or Letting on hire of the "BURLEIGH" ROCK-BORING MACHINES.

LONDON OFFICE, 96, NEWGATE STREET, E.C. MESSRS. T. BROWN & CO., ENGINEERS.

I. G. BASS, 18, BOW STREET, SHEFFIELD.



IMPROVED DESIGN of Engine for HAULING, for use with either Steam or Compressed Air.

Takes less room, and can be supplied for less money, than any other Engine of same power.

May also be had with single drum for winding.

SOLID DRAWN BRASS BOILER TUBES

FOR LOCOMOTIVE AND MARINE BOILERS,

EITHER

MUNTZ'S OR GREEN'S PROCESS

MUNTZ'S METAL COMPANY (LIMITED),
FRENCH WALLS,
NEAR BIRMINGHAM.

MINERS

PRICKERS AND STEMMERS

OF

MUNTZ'S METAL.

ACCORDING TO THE NEW MINES REGULATION ACT.

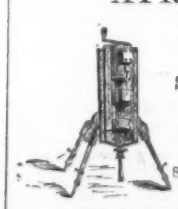
BEST KNOWN MATERIAL.

MUNTZ'S METAL COMPANY (LIMITED),
FRENCH WALLS.
NEAR BIRMINGAM

DUNN'S ROCK DRILL,

AND

AIR COMPRESSORS,



FOR DRIVING BED ROCK TUNNELS, SINKING SHAFTS, AND PERFORMING OPEN FIELD OPERATIONS,

IS THE

CHEAPEST, SIMPLEST, STRONGEST, & MOST EFFECTIVE DRILL IN THE WORLD.

OFFICE,—193, GOSWELL ROAD
(NEAR SPENCER STREET),
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Ore Crushers, with H.R.M.'s New Patent Crushing Jaw.

EXTENSIVELY USED BY MINE OWNERS.

Few Working Parts.
Small Wear and Tear.
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Simplicity of Construction.
Excellence of Sample.
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ALSO,

ROAD METAL-MAKING MACHINES,

WITH

H.R.M.'s New Patent Cubing Jaw,

FOR

REDUCING THE MATERIAL TO

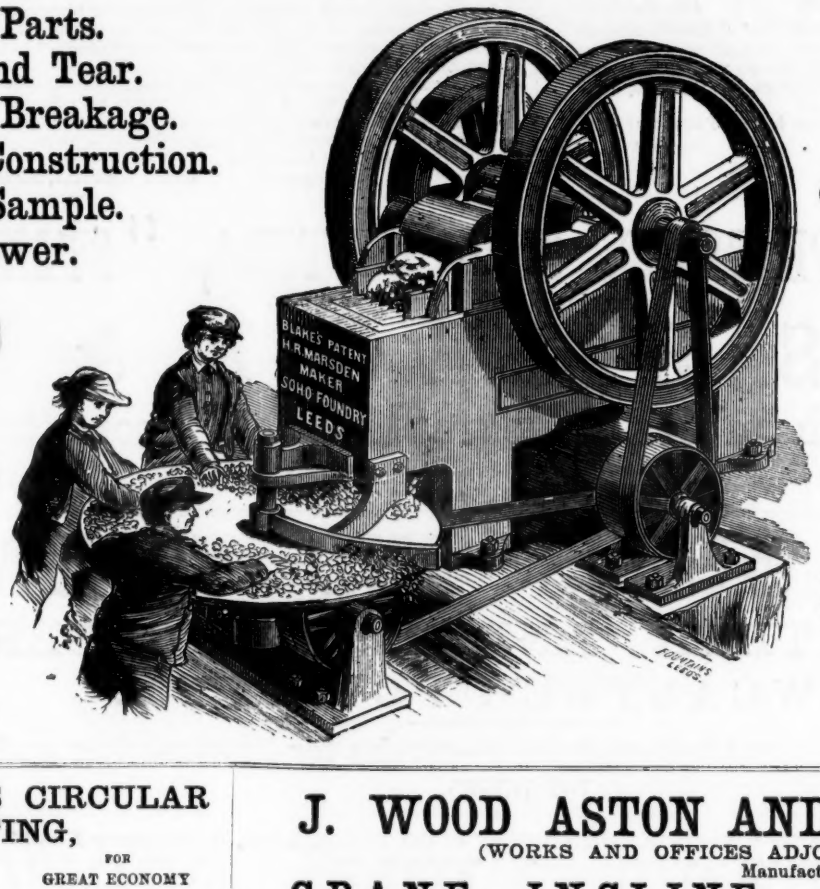
ANY REQUIRED SIZE.

EXCLUSIVELY ADOPTED BY HER MAJESTY'S GOVERNMENT.

H. R. MARSDEN, LEEDS,

ENGINEER,

Immense Saving of Labour.



Mining Improvements. Revolving Picking Table.

950 NOW IN USE.

AWARDED 45 GOLD AND SILVER MEDALS.

By the PATENT MACHINE

HERE ILLUSTRATED

60 to 70 Tons of Ore

MAY BE

CRUSHED OR SEPARATED

PER DAY OF TEN HOURS.

EXTRACT FROM TESTIMONIALS:

"Although I have travelled hundreds of miles for the purpose of, and spent several days in, examining what are styled ORE CRUSHERS, yours only embrace and combine the true principles of action and construction for the purpose designed."

CATALOGUES FREE on application to

H. R. MARSDEN,

Patentee and Sole Maker,

LEEDS.

M'TEAR AND CO.'S CIRCULAR FELT ROOFING,

FOR GREAT ECONOMY AND CLEAR WIDE SPACE.

For particulars, estimates, and plans, address,—

M'TEAR & CO.,
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MANCHESTER;
OR
CORPORATION STREET,
BELFAST.

The above drawing shows the construction of this cheap and handsome roof, now much used for covering factories, stores, sheds farm buildings, &c., the principal of which are double bow and string girders of best pine timber, sheeted with ½ in. boards, supported on the girders by purlins running longitudinally, the whole being covered with patent waterproof roofing felt. These roofs so combine light ness with strength that they can be constructed up to 100 ft. span without centre supports, thus not only affording a clear wide space, but effecting a great saving both in the cost of roof and uprights.

They can be made with or without top-lights, ventilators, &c. Felt roofs of any description executed in accordance with plans. Prices for plain roofs from 30s. to 80s. per square, according to span, size, and situation.

Manufacturers of PATENT FELTED SHEATHING, for covering ships' bottoms under copper or zinc.

INODOROUS FELT for lining damp walls and under floor cloths.

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PATENT ASPHALTE ROOFING FELT, price 1d. per square foot.

Wholesale buyers and exporters allowed liberal discounts.

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HEPBURNS' PUMP LEATHER WATERPROOF

By a special method of preparation, this leather is made solid, perfectly close in exture, and impermeable to water; it has, therefore, all the qualifications essential for pump buckets, and is the most durable material of which they can be made It may be had of all dealers in leather, and of—

I. AND T. HEPBURN AND SONS,
TANNERS AND CURRIERS, LEATHER MILLBAND AND HOSE PIPE MANUFACTURERS,
LONG LANE, SOUTHWARK, LONDON
Prize Medals, 1851, 1855, 1862, for
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THE GREAT ADVERTISING MEDIUM FOR WALES.

THE SOUTH WALES EVENING TELEGRAM
(DAILY), and
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CHIEF OFFICES—NEWPORT, MON.; and at CARDIFF.

The "Evening Telegram" is published daily, the first edition at Three P.M., the second edition at Five P.M. On Friday, the "Telegram" is combined with the "South Wales Weekly Gazette," and advertisements ordered for not less than six consecutive insertions will be inserted at an uniform charge in both papers.

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GUIDE TO HEALTH; or, ADVICE AND INSTRUCTIONS FOR THE CURE OF NERVOUS DEBILITY.—A New Medical Work on the Treatment of Local Debility, Consumption, Loss of Memory, Physical Depression, Indigestion, and all diseases resulting from loss of nerve power. Illustrated with cases and testimonials. Sent free for two stamps.—Dr. SMITH will, for the benefit of country patients, on receiving a description of their case, send a confidential letter of advice.—Address, Dr. H. SMITH, 9 Burton-crescent London, W.C.

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Manufacturers of

CRANE, INCLINE, AND PIT CHAINS,

Also CHAIN CABLES, ANCHORS, and RIGGING CHAINS, IRON and STEEL SHOVELS, SPADES and FORKS, ANVILS, VICES, SCYTHES, HAY and CHAFF KNIVES, PICKS, HAMMERS, NAILS, RAILWAY and MINING TOOLS, FRYING PANS, BOWLS, LADLES, &c., &c.

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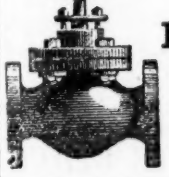
For WATER SUPPLY to TOWNS, LAND IRRIGATION, and MINERAL EXPLORATIONS, may be executed of any diameter, from 6 in. to 36 in., and to any depth to 2000 ft.,

Pistons & Air-pump Buckets fitted with Patent Elastic Metallic Packing

of which upwards of 8684 have been made to March, 1875.



MATHER AND PLATT,

MAKERS OF LARGE PUMPS AND PUMPING ENGINES.

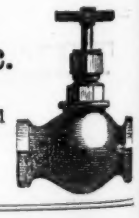
Improved Valves and Taps for Water, Steam, Gas, &c.

PATENT STEAM EARTH-BORING MACHINE

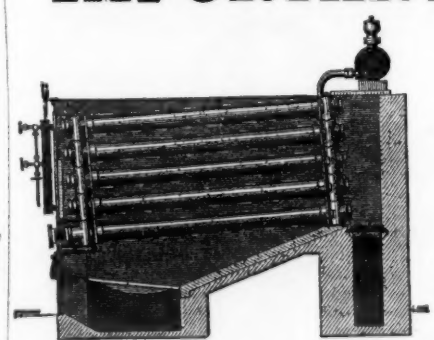
ENGINEERS and MACHINE MAKERS to CALICO PRINTERS, BLEACHERS, DYERS, and FINISHERS.

SALFORD IRONWORKS, MANCHESTER.

PRICES AND PARTICULARS ON APPLICATION.



IMPORTANT TO STEAM USERS.



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Desire to call the attention of Steam Users to some important improvements recently introduced in these Boilers, by which any points of objection to previous designs are entirely overcome, whilst the valuable principle, so widely recognised, is retained.

In the improved Boiler there is neither welding or screwing, and the whole of the interior is readily exposed to view and cleaned out. The more simple construction of the improved Boilers admits also of a substantial reduction in price.

Twenty of the Howard Safety Boilers, of 60-horse power each, are in use at Barrow, and altogether about 800 are successfully at work. The Boilers may also be seen at work at Messrs. J. and F. Howard's, Britannia Ironworks, Bedford.

FOR PARTICULARS, APPLY TO

THE BARROW SHIPBUILDING COMPANY, LIMITED,

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THOMAS WARDEN & SON,

IRON, STEEL, AND GENERAL MERCHANTS,

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Manufacturers of Anvils, Vices, Hammers, Bellows, Tue Irons, Hydraulic and Screw Jacks, Crabs, Cranes, Spades, Shovels, Picks, Arms and Boxes, Axles, Springs, Hurdles and Fencing, Screw Bolts, Washers, Hames, Chains, Files, Nails, &c., &c.

SECOND-HAND RAILS, AND EVERY DESCRIPTION OF RAILWAY, COLLIERY, AND CONTRACTORS PLANT ALWAYS ON HAND.

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